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The collection of shop kinks in the current issue contains the first and second prize awards in the January competition. The first prize, of $50, was awarded to F. C. Pickard, assistant master mechanic of the Cincinnati, Hamilton & Dayton; Indianapolis shops. The second prize, of $25, was awarded to W. H. Snyder, assistant general foreman of the New York, Susquehanna & Western; Stroudsburg shops. We wish to extend our hearty congratulations to these gentlemen for their work, and to say, as we have said to them personally, that they are performing a real service to a very large number of mechanical men in placing before them these devices for producing shop efficiency. Our next competition will close February 7. As before, we are offering a first prize of $50 and a second prize of $25 for the best collection of shop kinks, each prize to be awarded on the basis of a collection of not less than three nor more than five kinks, although competitors are advised to submit a larger number, so that the judges will have range for selection. Competitors are urged to make their descriptions full; the editors of the *Railway Age Gazette* have had to do a good deal of work in making clear some of the devices shown in this issue.

The duty on oranges and lemons has been increased, and the statement has been quite generally made in the press that the railways have so increased their rates as to deprive the grower of all the advantage from the duty. The facts in the case are as follows: There has been no change proposed in the freight rates on oranges and lemons grown in Florida. The rates from California to points west of Chicago will be unchanged, but it is proposed to advance the rate on November 1 by the sum of 15 cents per 100 lbs. from California to Chicago and all eastern points. Now, the advance in the rate of duty is from $1.00 per 100 lbs. to $1.50 per 100 lbs.—from six to ten times the proposed increase in railway rates. Up to 1901 the rail rate was $1.25 per 100 lbs. The fruit industry at that time was not at all prosperous and the railways reduced the rate to $1.00 per 100 lbs., with the thought that as soon as the industry was on its feet the rate could be advanced. This rate has been continued up to the present time, and it will be noted that the proposed advance does not reach the old rate. If the increase in duty has anything to do with the increase in freight rates, the railways are not, by any means, getting the lion's share.

THE IMPORTANCE OF THE MECHANICAL ENGINEER.

The Hudson-Fulton celebration, following so quickly after the remarkable performances of flying machines in France, brings to mind in the most forcible manner what the mechanic and the mechanical engineer have done for transportation. It has been just one hundred years since the mechanic first turned his attention to this problem, and during that period all the large problems connected with it have been solved. He has developed means for transportation on the water and under the water, on land and in the air. The work of Fulton and Stephenson has had a greater influence on the spread of civilization, and perhaps modified our methods of living more than all other influences combined. It is too early yet to predict what will be the effect of that of the Wright brothers.

We have before us the diary of a man who, in 1830, went from the vicinity of Boston to Tuscaloosa, Alabama, "in the marvelously short time of three weeks," which he adds was "little short of flying." Can we conceive what effect a return to such methods of transportation would have on modern life? No other evidence, however, is needed to prove that the mechanic and the mechanical engineer are dominant forces in modern life, and the question of how to use them to the best advantage becomes one of great importance. That the community to-day is not getting from the mechanical eengineer all it could, and should, is all too evident; but how to make his influence more thoroughly felt is not as clear. Perhaps the first step in this direction is to make the public appreciate more thoroughly what he has already done, and that he is every day solving for their benefit problems of which they have never heard.

The only engineer most people know anything about is the locomotive engineer, and it was no exaggeration when John Fritz said, a few years ago, that the average man pictured a mechanical engineer as having a bunch of waste in one hand and an oil can in the other. Perhaps this general conception has had something to do with the difficulty the mechanical engineer has in making himself heard. When the public in general realizes that his principal tools are not bunches of waste and oil cans, but science and mathematics, he will have a better chance to do his work properly. In most industrial enterprises the work of the mechanical engineer is not directly revenue producing, but of a preliminary or auxiliary nature. Hence the financial man, who usually has eyes only for actual income and expenditure, is all too apt to cut off auxiliary expense when his income is diminished, thereby hampering the engineer and making the whole organization less efficient.

It is a notorious fact that the motive power department of a railway most often has to suffer when the income is a little short, because this does not at once affect the income. In the long run, however, there is no department in which false economy may have such a bad effect as in the motive power

department. As a matter of fact, increased efficiency in this department will usually result in increased efficiency over the whole line. But difficulty of proving this to the man who does not recognize efficient operation of a machine when he sees it is so great that it is not often even attempted, and the superintendent of motive power takes what he can get and is thankful.

EFFICIENCY OF OPERATION.

The recent furor in the magazines about the attempt of an alleged trust to get control of the water powers of the country had little direct importance. Indirectly, it was a striking testimonial to the work of the mechanical engineer. The power of the waterfall is of no value unless the engineer harnesses it to his turbines and directs its application. The power lying dormant in the great deposits of coal became available only when the mechanic made the steam engine, which, in its various forms, does the work of thousands of men and horses in every corner of the earth. It is impossible to form an estimate of what the steam engine means to modern life, but the part it plays may be hinted at by a consideration of the fact that the millions of dollars spent in railways are spent simply to enable us to utilize efficiently the power of the locomotive.

The cost of the road, however, is so much greater than that of the locomotives that the latter are often not given as much consideration by those financially responsible as they are entitled to. Naturally the items needing the largest expenditures receive most attention from the financial heads, with the result that the needs of the locomotives themselves are sometimes neglected. The man that has the authority to spend the money does not realize the importance of these needs. When it comes to the maintenance and repair of locomotives, or indeed of any kind of machinery, it is the mechanical engineer who knows what he needs and when he needs it. This knowledge, however, is not sufficient; he must study the problems of labor and management in order to utilize it properly. As railways are now managed, the superintendent of motive power is often obliged to take for materials what the purchasing agent or storekeeper will give him; and do what he will, he is often compelled to run his department inefficiently, in accordance with the ideas of those who are in control of the finances. This condition can only be modified when he has proved his ability as a manager. As the head of large repair shops, the superintendent of motive power should be able to do work as cheaply as the average manufacturing company does similar work, but he is notoriously unable to do so. Why this is so interests him quite as much as others.

It is absurd to suggest that the average superintendent of motive power is less capable, or less conscientious, than his associate doing similar work in other lines, and the cause must be sought not so much in the man doing the work, but in the conditions under which it is being done and the methods he is forced to employ. His large problem is how to free himself of the hampering conditions by which he is surrounded, and to put himself on a plane where he will have the same opportunity for efficient work that the superintendent of manufacture usually has. In ordinary manufacture the superintendent specifies what the purchasing agent shall buy, and what the storekeeper shall keep in stock. If the superintendent of motive power will keep such records as will show the financial management the savings he could make by having the same privilege it would be but a short time before he could get it.

Again, moreover, in spite of the fact that the work of a machine shop clerk is much more difficult than the clerical work of the auditor's office, the shop clerk is seldom allowed as much money as the office clerk. The shop clerk is looked upon by the auditing department as an unnecessary expense. There was a day when the auditor regarded a draftsman in a similar light. To-day, good draftsmen are essential to economical manufacture, and it will not be long before good shop clerks will be considered just as important. This change will take place as soon as the idea of cutting expenses gives way to the idea of efficiency. There is no objection to large expense if you get correspondingly large returns. In fact, large expenses are necessary to large returns, and when the management of large corporations, and railways in particular, begin to concentrate attention on efficiency rather than expense, the mechanical engineers will be listened to more attentively.

SHOP KINKS AND SHOP EFFICIENCY.

If everything mechanical had been developed to the point where improvement was impossible, and if everybody understood and adopted the best practice, then there would be no such thing as a shop kink, and individual effort would have no place. With the present mechanical and mental equipment of the world, however, the shop kink has a very important place in the economy of shop operation. The shop kink is usually understood to be a home-made piece of mechanism or appliance for performing some piece of work in a cheaper and more expeditious manner than would be possible with the ordinary machine tools—store tools, as a countryman might say. Where these kinks have been adapted to their purpose with skill they have outgrown the limitations of their original environment and have been taken into the great family of machine tools, so that the market is filled with appliances that started originally as kinks and then received extensive recognition of their value. For example, it is not so very many years ago that a master mechanic was showing, with great pride, a kink consisting of a cylinder and piston with its rod that, by means of compressed air, was used to lift work on and off a planer. A discarded Westinghouse brake pump served to supply the air, and the master mechanic was jubilant at the idea of thus saving the services of a helper.

The idea caught, and compressed air as a means of hoisting was taken from among the "kinks" and put on the basis of established practice. So with many other devices, such as the swinging link grinder, the pressure for putting couplings in air-brake hose, the presses for brasses and the like, through a range so wide that to catalogue it would be to write a book.

The source of the kink may be a suggestion remote from the purpose. It may come to the workman, the foreman or the superintendent, but its aim is always to increase the efficiency of the workman and enlarge his output. The kink often comes from the dire necessity of making bricks without straw. The management insists upon reduction of unit costs, and, at the same time, calmly refuses an appropriation for better tools by which that reduction can be brought about. So the foreman or the workman schemes, and, searching in the scrap, he pulls out an old cylinder here, and a frame there, and a rusty lever from another place. Then he puts them together and produces a kink that cuts up scrap, or shears staybolts, or does some other thing which reduces time expenditure from hours to minutes, and his road reaps the benefit, with all too little thanks to the originator.

Unfortunately, this is too often a state of affairs that reacts directly upon the man who encourages it. We all like to receive the credit for our achievements, and some of us are willing occasionally to appropriate that belonging to others as well. Yet the "boss" who does this is striking a hard blow against the loyalty of his men, whereas the spirit of giving credit will be repaid a hundred-fold. Take two instances, to point the moral: On a certain western road there was a superintendent, ignorant, selfish, domineering, promoted from engineer, of small ability, whose sole hold on his position lay

in his power to convince the manager of his great ability. He constantly showed the manager some new wonder of his originating. His method was practical and direct; he simply appropriated everything that was done as his own, and was cordially hated accordingly. Every man on the road "had it in for him," and finally a new management "saw," and he was dropped over night and his railway career was at an end. Meanwhile, it was a common saying, "Oh, there's no use getting up anything new here, ——— will only take it." The road suffered and the administration of the man dropped far below the point of efficiency that it might have reached by exercise of ordinary fairness.

In contrast, there was once a superintendent of motive power who was keenly alert to anything and everything that would cut down cost and add to shop efficiency. He would give every promising device a trial, and then help the man who got it up to patent and exploit it, and he made it his custom to call attention to these kinks, and add that John Jones did this or Tom Murphy that. Consequently, his shops swarmed with kinks, designed by all sorts and conditions of men, and costs were correspondingly low, while the superintendent was supported by the greatest loyalty and devotion from all who came in contact with him.

In a word, this simple matter of giving credit where it is due has an effect on shop costs that is literally incalculable, because the loss in the absence of it can never be known.

This principle shows another danger which is incurred when the uninformed criticize shop management and efficiency. It is an easy matter to find fault, but it is unsafe to do so until all the conditions of operation are known, when it will usually be found to be far more difficult to suggest improvements than at first appears. There are always local conditions that have to be taken into consideration, and it is apt to be the local condition that produces the kink and enhances its value.

At first the improvement may be a slight change in design that lessens the work of finishing without taking away from effectiveness; this leads to another and another until the whole method of manufacture has been changed.

Take as a simple example the design of crosshead slides. We had, at one time, an elaborate system of slippers and wedges and adjusting bolts. The bolts and wedges gave way to the plain flat slipper, to be renewed when worn out; then the slipper was babbitted to save it; then the crosshead was babbitted and planed to size to save the cost of the slipper and the fitting incident thereto, and finally the planing has been done away with and the crosshead is babbitted to size. Every step was a kink, and every one saved money to the railway—a sum which, if multiplied by all the crossheads in use, would be large.

With the other shop kink, that takes the form of a handy tool, it may be assumed that there is a saving always; otherwise it would not have been perpetuated. What the saving is depends entirely on what the tool is intended to do. Since we have learned what we know about the possibility of the flow of metal, the die forging in the blacksmith shop has cut the cost of many articles to a tenth of what it would be with the older methods, through the innumerable kinks that have been brought out, and so, all along the line these little things that flourish, for a time in private, often come into the market later as full-fledged tools of greater capacity than their predecessors, and the efficiency of the modern machine shop owes more than is ordinarily realized to what was once merely a "kink."

It is important for every shop foreman and for every master mechanic who has to do with shops, as well as for the higher officer who is interested in the economical operation of the road, to encourage the development of the kink, and there is no better way to encourage this development than to give full credit to the man who gets it up.

THE INCREMENT OF RAILWAY TAXATION.

About a year ago we had occasion to point out that the fiscal railway year, 1909, would show among its most striking of railway burdens the increase of that element in railway charges represented by taxation. The period of "railway baiting" by state legislatures in 1907, and still more conspicuously in the first six months of 1908, very clearly prefigured such an increase. It was not to be expected that the law-making bodies actively engrossed in methods of placing new burdens on the railways, meditating questions of fresh "regulation" and investing state commissioners with added powers, would overlook the weapon of taxation so ready at hand and so easily wielded. But the effects of the stroke were necessarily deferred. New taxation of almost every kind requires from twelve to eighteen months for its actual incidence to appear. There is the new assessment to be made, questions of readjustment to be settled and usually a legal interval before the taxes for the year are actually paid. One must wait a considerable time before statutary taxation gets in its full work, though in the end it usually comes with the certitude of the death with which taxation is proverbially bracketed.

The year's report of the Interstate Commerce Commission now gives us a preliminary hint of taxation's new onset upon the railways. The best comparison is obviously to be made on the basis of gross earnings per mile, to which all fixed charges naturally ratio. The return is very striking. The taxes were 3.6 per cent. approximately in 1909 as compared with 3.4 per cent. approximately in 1908, or an actual absolute increase of about 6 per cent., and this notwithstanding the assessments were presumptively made in 1908, a year of depression when taxes levied on market values of railway stocks—as distinguished from bonds—must in many cases have decreased—a noteworthy feature in the case of the New England railways. Looking back into past years, one finds that as compared with the year 1906 on the basis of gross earnings taxes in 1907 fell from about 3.2 per cent. to about 3.1 per cent. But this is due largely to an increase of gross earnings from $10,460 to $11,383 per mile, taxes absolutely increasing from $336 to $353 per mile—and this sudden lift of gross earnings tends to vitiate comparison of 1907 with 1908 when gross earnings fell from $11,383 per mile, as stated, to $10,778 per mile and taxes in ratio to net earnings rose from about 3.1 per cent. to about 3.4 per cent. Broadly expressed and using five years as a basis of comparison, railway taxes per mile of railway operated show an increase for the period from $292 per mile to $382 per mile on the railway increase of nearly 31 per cent. Taking gross earnings per mile as a basis, the increase for the period is from about 3.0 per cent. to 3.6 per cent. approximately or an actual increase of taxes of about 20 per cent. And finally, but not least important, hard times have not lessened railway taxation but decidedly increased it.

One could emphasize the situation by the citation of special cases. Thus the New Haven road paid out in taxes last year no less than $3,446,125, or some $1,700 per mile, or about 6.5 per cent. on gross earnings per mile. Taxes amounted to more than 3.4 per cent. on its outstanding capital stock, which paid 8 per cent. on the par to shareholders, or say 5 per cent. to investors at the market price. But it is fairer to take the average for the American railway rather than the extreme case, except as such a case suggests the wide range and disparities of the tax burden.

It is a fact of gravity which the railway corporations of the land face in this steady increment of taxation. If taxation adjusted itself to the prosperity—or lack of it—of the railways it would be one thing; quite another when taxes lift whether times are good or bad and whether the railway thrives or goes downward. It would be one thing if tax systems in the states were equalized or, at least, homogeneous, quite another thing when they are unequal, complicated often discordant. It would

be one thing if, as in the case of indirect taxes, they could be "charged up" to the consumer; it is another thing when they are charged up almost exclusively to the railway stockholder and any attempt to charge them up to the public—for example by increased rates—meets with the fiercest opposition. It is human nature to shift taxes if possible to the other man and the safety of the other man is in the equation of resistive power among the taxed; but states, constantly increasing their own expenses, often too lavishly, find an implement of taxation both too facile and too unjust when new taxes can be levied in mass on the corporation and diverted from the individual. The political and partisan favor which such "mass" taxation, aimed at the aggregation of capital rather than the civic unit, finds is a fact which all corporations must confront.

It explains as a basic but inequitable truism the steady increments of railway taxation cited; and the added increment of the new federal corporation tax is yet—perhaps—to be heard from.

CRANES AND DROP TABLES FOR ERECTING SHOPS.

The modern erecting shop with double-deck cranes is a very expensive plant, and while it may be justified where there is a large number of locomotives concentrated at one point and a large number of repair pits, yet there is a limit somewhere, beyond which the interest and depreciation on the plant makes too large a charge against locomotive repairs. The heavy expense is not only in the large cranes, which cost about $15,000 each, but the cost per cubic foot of erecting shop increases much more rapidly than a direct proportion, as the height of the building is increased for an upper deck runway. This is due to the heavy columns necessary for the support of the load of crane and locomotive at a height of 42 ft., making the cost of the steel structure girders and columns about $75 per running foot. The cost of a complete locomotive shop for the repairs of 500 locomotives as built according to recent designs is $1,500,000, and allowing 5 per cent. interest and 2 per cent. depreciation, the charge per locomotive for these items amounts to $200 a year, or 8 per cent. of the cost of repairs.

For smaller shops the outside transfer table is evidently a much cheaper method for the lateral movement of locomotives, as it has its supports directly on the earth and no expensive columns and girders are required, and the height of the building can be considerably reduced, with a large saving in that item. While light traveling cranes of a 10-ton capacity can be employed to advantage for hoisting the separate details, the heavy traveling crane and runway for the complete locomotive can be dispensed with by the use of a stationary bridge for hoisting. Such bridges were originally employed at the Oelwein shops of the Chicago Great Western and more recently at the new shops of the Pere Marquette at Grand Rapids.

As a further measure of economy in the construction and equipment of small erecting shops, it would seem possible to return to the old drop table method. It could be operated rapidly by electric motors or by a system of jacks operated in series by the same kind of motors. The East Altoona roundshop is equipped with a large drop table, and the screws are driven by electric motors. Similar tables, large enough to unwheel a consolidation engine, are to be found in the Dunmore shop of the Erie Railroad and the Ivorydale shop of the Cincinnati, Hamilton & Dayton.

By the crane hoist method the whole weight of the locomotive is lifted and, as above explained, the steel structure and the cranes must be so large and heavy that they become very expensive. As the weight of four pairs of drivers of a consolidation locomotive is about 20 tons, while the whole locomotive weighs over 100 tons, the drop table need have a capacity of only one-fourth or one-fifth that of the hoisting cranes. The drop table is becoming an essential part of the equipment of every large roundhouse. For erecting shops it is usually regarded as obsolete, in competition with cranes; yet, where the system is properly developed, not only for rapid movement in dropping and elevating, but for the quick movement of the wheels on the two levels, the table of jacks system has possibilities which are worthy of consideration when economical construction is desirable for small shops.

NEW BOOKS.

Valuation of Public Service Corporations. By W. H. Williams, third vice-president of the Delaware & Hudson Company. Pamphlet; 6 in. x 9 in.; 51 pages.

The pamphlet at hand was prepared by Mr. Williams for discussion at the joint session of the American Economic Association and the American Political Science Association held in New York December 30, 1909. We have already published in the *Railway Age Gazette* the greater part of Mr. Williams' subject matter, which is a close and careful review of the problem of valuation as viewed by commissions, state and national, and its bearing on national policy. Mr. Williams points out that railways do not usually object to having a valuation placed upon their property; in effect such valuations are daily attempted with greater or less success by subscribers to new issues of securities; but there is serious objection to an incomplete and misleading valuation bearing the stamp and carrying the weight of government sanction, which can be of no practical advantage to the government, the public or the railway, but may easily injure the public and the railways by disturbing the confidence of the former and by hampering the activities of the latter. There are only three purposes for which valuation has been suggested; rate making, control of security issues and depreciation. But, unless the Supreme Court overrules its well considered decisions, such partial valuation cannot possibly form the basis of determination of any rate or rates, general or special. Mr. Williams believes that control of security issues cannot be vested in the commission under the federal constitution; hence that there can be no advantage in securing a valuation to facilitate the performance of a function which does not now and probably never will exist. As regards federal taxation, Mr. Williams points out that a partial and unequal valuation could not be the basis of a fair tax. Congress has already elected to tax all corporations, including railways, upon their net profits, to which a physical valuation can have no relation. If in future other methods of taxation should be proposed to which any valuation is relevent, it will then be soon enough to provide for a valuation which will harmonize with the system under consideration.

A Treatise on Masonry Construction. By Ira O. Baker, Member Am. Soc. C.E., Professor of Civil Engineering, University of Illinois. Tenth edition, rewritten and enlarged. John Wylie & Sons, New York. Chapman & Hall, Ltd., London. 745 pages, 244 illustrations and 100 tables; 5¾ in. x 9¼ in. Cloth. Price, $5.00.

One of the preceding editions of this excellent authority on masonry construction, which was first issued in 1889, will undoubtedly be found in the library of every technical man who has to do with general construction work. So well known and highly valued is it that any remarks as to its excellence are superfluous.

This new edition has all of the merit of its predecessors with the additional advantage of being to date as regards general masonry and practically new as regards concrete. It has been entirely revised and much of it re-written. The number of pages has been increased over the ninth edition from 556 to 745, largely under Part II, Preparing and Using Materials. New chapters on Reinforced Concrete, Concrete Building Blocks and Elastic Arch have been added. The matter regarding Stone Masonry has been little changed. Concrete-Steel Skeleton Construction is not discussed, being considered as coming under steel construction rather than masonry. The chapter on Reinforced Concrete is excellent as

far as it goes but is not as complete a discussion as will be found in books entirely devoted to this subject. The following chapter on Artificial Stone is of much interest, as is an earlier discussion of Sand Lime Brick. There is much other new material scattered through the book, all treated with the same characteristic sound judgment which has marked previous editions.

For the sake of those who are not familiar with the scope of the work—it is divided into four parts: Materials; Preparing and Using Materials; Foundations, and Masonry Structures, respectively. Part I covers Natural Stone, Building Brick, Common and Hydraulic Lime, Hydraulic Cement and Sand, Gravel and Broken Stone. Part II covers Lime and Cement Mortar, Plain Concrete, Reinforced Concrete, Concrete Building Blocks and Artificial Stone, Stone Cutting, Stone Masonry and Brick Masonry. Part III covers Ordinary Foundations, Pile Foundations and Foundations under Water. Part IV covers Masonry Dams, Retaining Walls, Bridge Abutments, Bridge Piers, Culverts, Voussoir's Arch and Elastic Arch. In an appendix are specifications for Cement, Concrete and Railway Masonry. There is an excellent subject index at the end. The general typography and makeup is of the well known Wylie standard.

Contributed Papers.

THE GRAND TRUNK SHOP APPRENTICE SYSTEM.*

The problem of supplying the demand for thoroughly trained mechanics has for some years caused much anxiety, and the Grand Trunk some years ago endeavored to fill the breach and pioneered a movement which has since been copied on a minor scale by all the great railways of Canada and the United States, as well as the largest manufacturing firms in both these countries, namely, the technical training of their apprentices. Night schools, while beneficial, are in the most part drudgery, owing to the subjects taught not bearing directly on the daily work.

The Grand Trunk started a class for its apprentice boys, and in a surprisingly short time it was found necessary to increase the scope of the teaching, as the apprentice boy of the day saw within his grasp the very highest position of responsibility in the management and operation of the road. He realized that here was an opportunity to obtain an education little short of a college course, with a minimum exertion on his part and at the same time be independent and self-supporting.

From the commencement on a small scale, the system has grown until at the present time there are technical schools at all important centers throughout the entire Grand Trunk System, and hundreds of scholars are enrolled, while every large railway system of this continent boasts several graduates of the G. T. training school as their chief mechanical engineers, and more than one of our largest industrial concerns have graduates as their chief draughtsmen.

The subjects taught are graded to suit the student's ability, and in dozens of cases boys who left school when in the second book can now do problems which would tax the powers of a high school graduate to the utmost. The subjects comprise everything from simple arithmetic to higher mathematics, mechanics, machine design and mechanical drawing. The entire cost is borne by the Grand Trunk System, and further encouragement is given by the large number of prizes given annually, open to competition. These include free scholarships in engineering at McGill University, as well as handsome cash prizes.

*From a pamphlet issued by the railway company.

Compulsory Night Classes.—For two evenings a week during the fall and winter months the student must attend mechanical drawing classes, study of practical mechanics and elementary electricity, the most competent instructors procurable being provided. On the staff are two graduates of American and Canadian engineering colleges, Purdue and McGill. The work in the drawing class is outlined in a special text book written by the company's chief draughtsman at Montreal, who is also the author of the book used on practical mechanics. During the term frequent examinations are held, and the points gained by each boy are posted. The master mechanic is constantly in touch with each boy's progress and standing, and if necessary he calls a boy up, and in a kindly manner points out to him the necessity of applying himself more consistently to bring his rating up to the required standard.

Prizes for Best Work.—The annual competitive examination is always conducted by the company's chief draughtsman from Montreal. Prizes are awarded to the apprentices obtaining the highest average in their respective years. These prizes amount to $40 for each shop, and are distributed over the different years of apprenticeship, thus: the apprentice obtaining the highest average for his first year in mechanical drawing gets $4, and the one obtaining the highest in practical mechanics gets $4 also. Therefore, it is quite possible for one apprentice to obtain both prizes.

A keen interest is taken in this examination, which takes the form of a contest between the various shops. In addition there is a capital prize of $25 for each subject. This is competed for by the apprentices obtaining the highest averages in drawing and practical mechanics at their respective stations. These apprentices are given a trip to some point on the system where the final examinations are held, and the one receiving the highest number of points in each subject receives the $25. This, in addition to what he has already received at his station, will make a total of $29, $33 or $58, if he has been successful in all subjects.

After the season has closed, the boys at some of the large shops hold what is termed "Apprentice Night." This is the social event of the season. Each one makes a drawing, which is neatly gotten up and inked in. This is placed on exhibition, and the prizes are awarded for each year of apprenticeship. These prizes amount to $2.50 for the first prize, and $1.50 for the second prize. There are also prizes offered for special colored drawings amounting to $3 for first prize, and $1.50 for second prize. This may be competed for by any apprentice, irrespective of his year, and considerable interest is manifested by those of artistic ability.

The form of apprenticeship which has been adopted has been in successful operation for a number of years and has been the means of supplying the company with skilled mechanics in the most satisfactory manner. All apprentices are indentured to machinist's trade for five years, and to blacksmith's, boilermaker's, or other trades for four years. Five cents a day is deducted from the wages of each apprentice, and the total amount is returned to him at the expiration of his apprenticeship with an addition of $25 as a bonus if services have been entirely satisfactory.

The first requisite in employing an apprentice is to know that he is morally, physically and mentally capable. The examination being satisfactory, he is provided with a text-book for his instruction and guidance. This book contains examinations for the apprentice for each promotion he takes while serving his apprenticeship, and if he fails in any of these examinations he is set back to his old position for another term and the next apprentice in turn is promoted ahead of him. When another promotion is necessary the apprentice who failed is given another opportunity to qualify. If he fails the second time he is either dismissed from the service or given some minor position he is capable of filling outside of the trade,

as it is concluded that he is either not sufficiently intelligent or too indifferent to make a mechanic.

After passing the entrance examination the apprentice is sent out to the boiler, blacksmith or coppersmith shops, or other shop, as may be required. He stays there from six to nine months, and is taught to be active and obedient, and to prepare himself for future promotions.

When a boy is to learn one branch of the business only, for instance, boilermaking, blacksmithing, steam-fitting, etc., he is only required to serve four years, but if he is to learn the machine work and fitting, he is required to serve five years, and all the machinists' apprentices are indentured for five years. In the case of the four-year apprentices being few in number after the first examination, in comparison to the machinists' apprentices, they are instructed in their business by the foreman in charge, and each year they are required to pass an examination in mechanical drawing before receiving their advance in wages, the same as machinists' apprentices.

The text-book makes the boy theoretically conversant with the work that is going to be done by him after his next promotion. While the apprentice is working at one machine he is studying as much as possible about the machine he is to go on next, and this leads him to read up in line with his work.

The indenture system has been found of great advantage both to the company and the apprentice. It has a tendency to keep the apprentice satisfied, and steady his energies along the required lines. It also prevents him from being tampered with by outside firms or corporations who desire to obtain the services of the boy as soon as he has become useful to the company who has instructed him. An apprentice is required to serve five years at the following rates: 8 cents, 10 cents, 12 cents, 15 cents and 17 cents per hour. Before he is granted each year's advance he is required to pass a written examination on shop work, also make a drawing of some detail part of a locomotive, as specified in the apprenticeship book, which examination and drawing must have the approval of the master mechanic and the superintendent of motive power before his advance is allowed.

The system insures thorough education in all details of the trade, and while some of the work may be specialized it is not done by the apprentice until he becomes a journeyman. For instance, the apprentice comes from the boiler shop to the machine shop, from the machine shop to motion bench, to the side rod bench, to the axlebox gang, to the steam pipe gang, to the valve gang, and finally to the erecting gang, so that after an apprentice is out of his time he is a specialist in any one of these branches.

This system of apprenticeship on the Grand Trunk has also been found to be the means of parents giving their sons who desire to enter the service a better education than formerly. Before its adoption the only requirement was that the boy had to be 15 years of age. It was found that parents took their boys away from school at 12 or 13 years of age and put them at some other work until old enough to enter the Grand Trunk shops. When the examinations were first inaugurated quite a number of the boys were turned down, and had to go back to school again before they could qualify to enter the service.

This has not only resulted in prospective applicants getting a better education, but has elevated the moral standing of the apprentices' work, and made the system attractive to boys who have passed the high school entrance examination, and who, although well advanced along the lines of school education, adopt the machanic's trade in preference to other pursuits.

The success of the apprenticeship system is imperatively dependent upon the careful management of the examinations and the compulsory attendance at the classes.

TRANSPORTATION OFFICERS' MEETING.

The winter meeting of the Association of Transportation and Car Accounting Officers was held at Chattanooga, Tenn., December 14 and 15, with about 100 members present, and President C. C. Riley in the chair. An interesting address was given by R. V. Taylor, General Manager of the Mobile & Ohio. The membership of the association represents companies operating 230,826 miles of road and having in service 2,274,488 cars. A resolution authorizing the executive committee to declare an assessment of such an amount as in its judgment may be necessary to properly carry on the work of the association was adopted. A proposed change in the constitution which will permit the appointment of an assistant secretary by the executive committee, and a proposed change in the by-laws changing the name of the committee on car service and per diem to read "Committee on Car Service," were laid over for action at the next meeting. The next meeting is to be held at Colorado Springs, Col., June 21 and 22.

The committee on car service made a report on pooling of freight cars. After an interesting discussion the committee was instructed to continue its investigations. The committee reported that at points where its recommendation with regard to the adjustment of switching reclaims in connection with the switching charges is in operation admirable results are being secured.

The committee presented certain revisions in the Standard Code of Switching Reclaim Rules adopted at the Montreal meeting last June. The changes suggested were adopted for submission to the American Railway Association.

The committee on office methods and accounting reported on the duplication of initials and numbers in the marking of freight cars. In compliance with the request of the American Railway Association reporting marks had been assigned to the cars contained in the list heretofore prepared and the code of markings is now in the hands of the A. R. A. The association adopted for submission to the American Railway Association a proposed change in Rule 11, code of per diem rules, which will definitely fix the time within which statements of errors or omissions in per diem reports may be presented and will discontinue the privilege of perpetuating a discrepancy claim when the claimant allows it to lie dormant in his own office for a period of six months.

The committee presented an extensive compilation indicating the condition of per diem reports as rendered by all railways for the month of October, 1098. As compared with the previous compilation (for October, November and December, 1906) this shows a decided improvement; but October, 1908, was a month in which general business was below normal, and as notice has been given that these statistics were to be prepared they naturally reflect the favorable conditions under which they were prepared.

The association adopted the recommendation of the committee to submit to the American Railway Association a revised form of individual discrepancy report in lieu of present Form I of the standard per diem blanks of the A. R. A.

Report Forms 24 (c) per diem report, (g) summary of per diem reports, (h) per diem adjustment report, (i) passenger equipment mileage report and (j) interchange report correction were also adopted for submission to the American Railway Association with recommendation that their use be made mandatory. However, the original report, form 24 (j), recommended by the committee for the correction of interchange reports was revised by the association to conform as to the column arrangement to the present A. R. A. interchange report form which includes a separation of loaded from empty cars. It was also decided to provide at the top of the blank a space on which to note the date of correction of interchange report.

The association adopted a set of instructions for handling

per diem claims, designed to secure uniform practice. The committee on handling railway business mail presented correspondence between one of its members and the post office department regarding the handling of claim papers with letter of transmittal separately enclosed. Under the decision of the post office department it appears that a package of claim papers may be sent to or beyond immediately connecting railways as "railroad business mail" without the payment of postage, provided the letter of transmittal is separately enclosed in a sealed government stamped envelope, sent separately or attached to the *outside* of the package of claim papers; and this irrespective of the fact as to whether the papers in the claim have previously traveled as railroad mail or as U. S. mail. This decision sustains the committee's interpretation (Montreal, June, 1909) of the orders and decisions of the post office department so far as they relate to the transportation of claim papers. The committee recommends that packages containing printed matter be so wrapped that they may be readily inspected and be marked "Printed Matter" or "Claim Papers," etc. It also calls attention to the saving that has been accomplished by some roads in taking advantage of its recommendations with regard to the perforation of stamps with identifying ownership marks for the prevention of pilfering, misuse, etc., and the economies possible by the assembling of outgoing mail at each general office or large division office for the purpose of consolidation.

Reports of progress were made by the committees on conducting freight transportation and conducting passenger transportation.

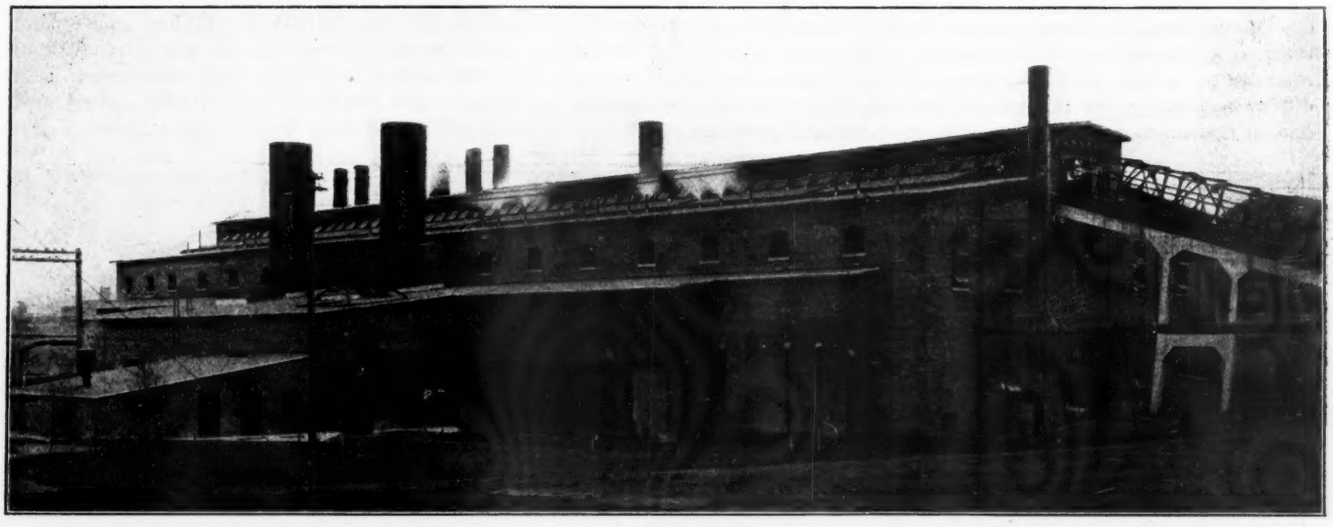
The committee on joint interchange and inspection bureaus presented its first report, which, in view of the short time since its organization, is necessarily one of progress only. It is understood that the committee will confer with a committee from the Master Car Builders' Association. When the work of the committee is fully under way it is anticipated that splendid results will be obtained from the investigation of the subject of "joint interchange and inspection bureaus" by the two committees representing the interests of the mechanical and transportation departments.

POWER DEVELOPMENT FOR THE SCRANTON SHOPS.

The power situation at Scranton, Pa., the location of the new Delaware, Lackawanna & Western shops, described in the *Railway Age Gazette* of November 5, 1909, is unique in that the possibility of failure and consequent closing down of the plant is reduced to a minimum. This is accomplished by the mutual relationship of four large and somewhat widely separated plants. Owing to the shops being located in the city and the necessity of carrying fuel to them from the mines, no power plant was built upon the grounds. Current for driving the machinery will be obtained from the Hampton plant, mines department of the railway, which plant will be enlarged for the purpose. This plant is located about three and a half miles from the shops near the mines and culm piles, from which fuel is obtained. Under ordinary working conditions, the generators in this plant will send a current of 4,150 volts to the shops. To guard against failure, the plant is connected with the two large city plants, which furnish light and power, and also with that of the Kaiser Valley car shops. In case of the failure of any one of the three, the others can be used to carry its load. This condition is not entirely true in case of failure of the Hampton plant, because of its size, although sufficient power would be available from the others to carry that part of its load which is an absolute necessity or the mine pumps and the essential elements of the shops.

The plant is interesting, not alone on account of its association with the railway shops but also on account of some peculiar features of its arrangement.

The engine and generator building is a brick structure, 42 ft x 108 ft. On the gallery floor are five Curtis turbines of



Boiler House; Hampton Power Plant of the Delaware, Lackawanna & Western.

500 k.w. capacity each, arranged along the wall. At the end of the building is a 2,000-k.w. turbo generator, built by the Allis-Chalmers Co., Milwaukee, Wis. A second generator of the same size and make has been ordered and will be in place soon. This second machine is intended to carry the load to the new shops. These turbo generators run at 1,800 r.p.m. and develop a current of 2,300 volts, which is stepped up to 4,150 volts for transmission. This voltage corresponds to that of the city mains so that the two can be used interchangeably. It is a three-phase 60-cycle current.

Indicated boiler pressure is 140 lbs., and it reaches the inlet of the engine at 125 lbs., from which it is wiredrawn down to 60 lbs for engine use. This latter pressure corresponds to a load of 2,700 k.w. The vacuum maintained is 27 to 28 in. The turbines are of the simple type without compounding but are run condensing. Tests show that they can work on 17.2 lbs. of steam consumption per kilowatt hour, which corresponds to 12.83 lbs. per horse power hour, a figure that is well down to the best performance of compound condensing reciprocating engines and much below the average practice. It is well known that these machines run with remarkable regularity, the variation in these instances being not more than five r.p.m., or a regulation at the speed of a little more than one-quarter to one per cent.

There are three transformers with a capacity of 1,200 k.w.

each in the house, all tied to the city mains, and one to be used for the shops of 1,500 k.w. They are all three-phase, 60-cycle machines, stepping up from 2,300 to 4,150 volts.

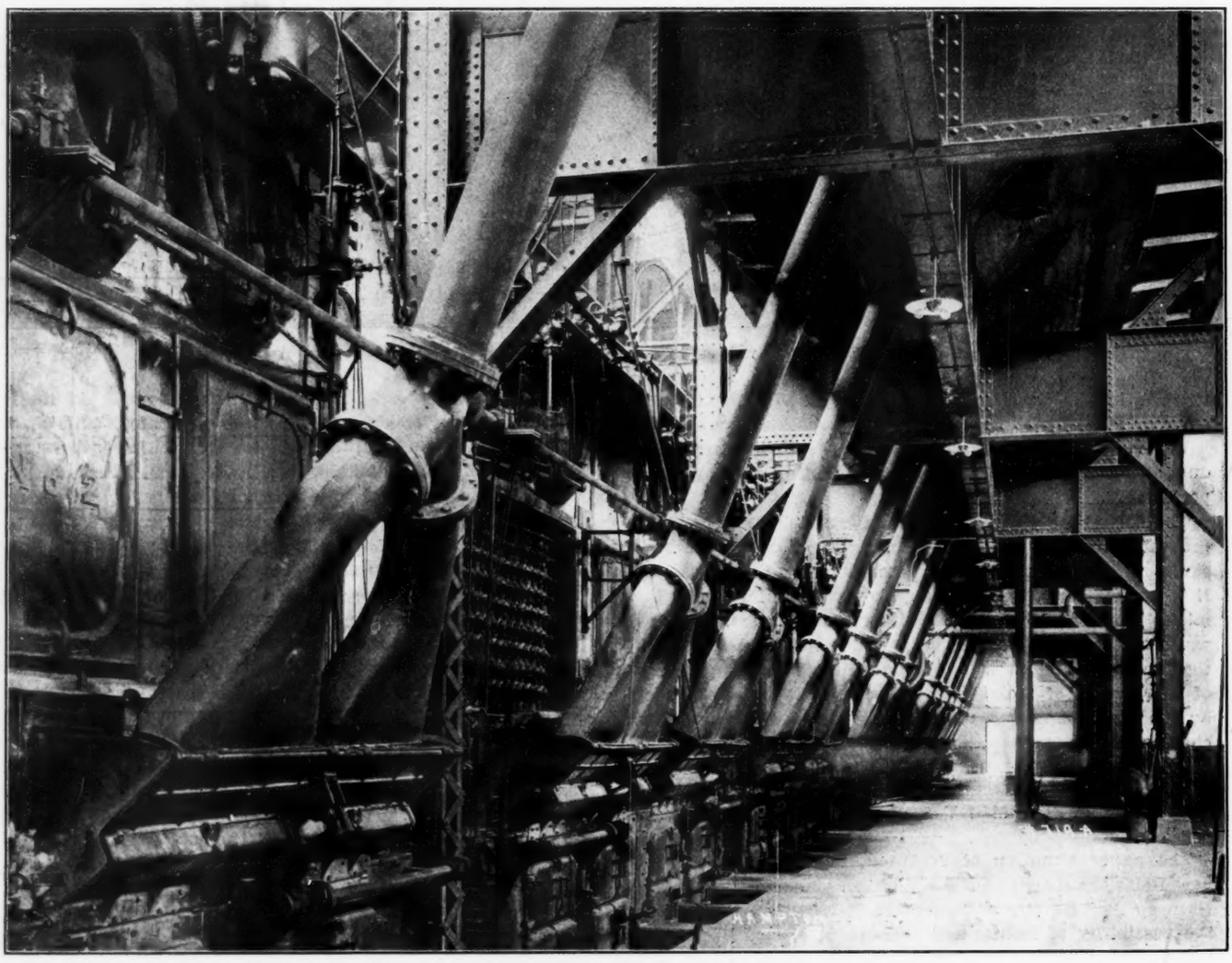
At the further end of the building is an induction motor generator, taking a current, 2,300 volts at 60 cycles, from the main generator and with a development of 85 h.p., driving a 50-k.w. generator, developing a current of 125 volts and 400 amperes at 690 r.p.m. for exciting the fields of the alternators. This completes the cycle. The main current is tapped for the motor which drives the generator, producing the current for exciting the main fields. As there is no current at starting, a separate exciting set is used for this purpose. This consists of a direct connected generator, a duplicate of the one described above, driven by a 12-in. x 12-in., 120-h.p. engine at 280 r.p.m.

All of this machinery is placed upon concrete foundations, extending up through the basement floor below. In the case of the main Allis-Chalmers generator, the foundations are hollow with an opening on the end facing a window in the basement wall. Through these openings and passages the air current for cooling purposes is drawn.

The switchboard occupies almost the entire length of the north wall of the building. The board itself is of marble slabs and on the several panels the operating switches for the many connections and combinations are arranged. The meters for measuring the current received from and delivered to the city mains are also placed on this board. There are two of them, one for each current direction. They are built with ratchets to prevent any possible backward registration. The difference between the readings of the two shows the balance due to one plant or the other. The switches are each in individual cells back of the switchboard and separated from it by a space of about three feet. They stand against the wall of the building. This is a wise precaution, in that it confines any trouble to the particular cell in which it originated and avoids all possibility of any extensive burning out. A case of this kind occurred but a short time ago, which, had the switch been on the back of the board and unconfined, would probably have crippled the entire plant. The basement of the building is occupied by the transformers and auxiliary machinery. This latter consists of several pumps and three regulators for the Scranton mines. There are two Worthington vacuum pumps for the Curtis turbines. These have steam cylinders 10 in. in diameter, vacuum cylinders 18 in. in diameter, with a common stroke of 18 in. There is also a separate vacuum pump for the Allis-Chalmers turbine. It has cylinders 10-in. and 24-in. x 20-in. stroke.

In addition to these there are two Blake 7½-in. x 3-in. x 10-in. pressure pumps for maintaining a pressure of 250 lbs. per square inch beneath the step bearings of the Curtis turbines. These pumps discharge into an accumulator having a lift of 8 ft. with an 8-in. plunger carrying a load of 18,000 lbs. With the installation of the second turbine generator another vacuum pump similar to that already in place will be set up.

The brick boiler house stands about 35 ft. west of the power house. The boilers have a total capacity of 8,445 h.p. There are 15 Babcock & Wilcox water tube boilers of 313 h.p. each and six two-drum Sterling boilers of 625 h.p. each. In the fitting up of these boilers, there is a 6-in. pipe extending around the building as a loop with which each boiler is connected, so that any unit can be cut out without disturbing the action of the rest. The boilers work under a pressure of 140



Interior of Boiler House; Hampton Power Plant of the Delaware, Lackawanna & Western.

lbs. The Babcock & Wilcox boilers are fitted with McClave stokers, driven by small slide valve engine. The Sterling boilers are hand fired, rice coal being used under all boilers.

Draft is maintained in the furnaces through a combination of a closed ash pan, forced draft and vacuum exhaust. Slightly superheated steam is also admitted to the ash pan in order to avoid the formation of clinker on the grates. This steam is superheated in a two-in. pipe that passes down the length of the battery back of the bridge walls, where it is raised from 15 deg. to 20 deg. Fahr. The pressure in the ash pans of the Babcock & Wilcox boilers varies from 1 in. to 1½ in. of water, while under the Sterling boilers it runs from ½ in. to ¾ in. This pressure is maintained by two 15-ft. diameter x 43-in. fans, driven by direct connected 13-in. x 16-in. engines, running at an average speed of from 150 to 200 r.p.m. At this speed the fans have a delivering capacity of about 100,000 cu. ft. per minute. Under ordinary conditions, one of these fans is sufficient for the work and the other is held in reserve in case of accident. Should the suction fan fail it may be cut out together with the economizer and the plant operated with the pressure fans alone, and the gases are sent direct from the boiler to the stack. The speed, however, is subject to wide variations, dependent upon the steam pressure and the demand upon the boilers. This is automatically regulated by mechanism devised by O. E. Williams, engineer of the plant, and will be described in detail in a future issue.

The exhaust fans are used entirely for removing the waste gases of combustion and are not intended in any way to create a draft. They produce the very slight vacuum of from ⅛ in. to 1/10 in. of water and have a capacity of about 100,000 cu. ft. per minute when running at a speed of 110 r.p.m. There are two of these fans, each 14 ft. in diameter x 84 in. wide. They receive the gases from the economizer and deliver them into the stacks. These fans are built by the American Blower Co., Detroit, Mich.

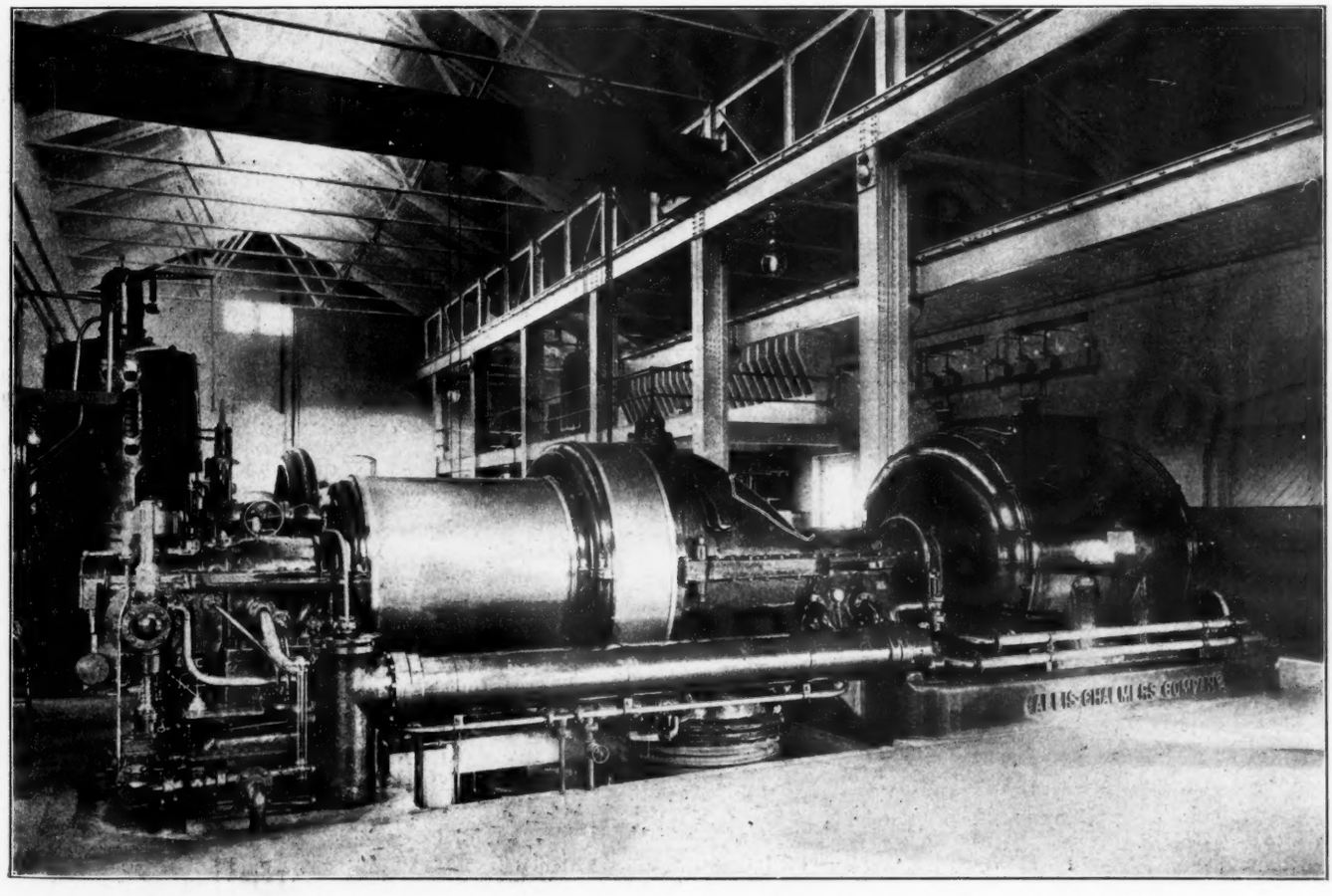
The water is fed to the boilers by two 22-in. and 12-in. x 24-in. compound Worthington pumps with an Epping-Carpenter tandem compound pump held in reserve. The water supply is obtained from the city works and bore holes in the hills. It is a surface water remarkably pure and very well adapted for boiler purposes. Although an analysis is not available, the results obtained in the boilers show that it is free from acid and scale forming properties. The boilers are blown down at frequent intervals and are drained for cleaning the tubes once every six months. At such times a small amount of soft deposit is removed but no hard scale. No boiler compounds are used.

The connections for blowing out are made from each pair of boilers led down to a concrete sewer beneath. Following approved practice the boilers are never blown off while hot but are allowed to cool before the water is drawn off. The water for condensation is obtained by mine drainage. It is acid in its reaction and can only be used in jet condensers. Four of the Curtis turbines and the Allis-Chalmers machine are so equipped. The fifth Curtis machine has a surface condenser and draws its supply from the boiler feed reservoir, discharging back to the source. This reservoir is a concrete tank, 100 ft. in diameter and 12 ft. deep, set in a hill at a small elevation above the engine house. The discharge from the surface condenser serves to warm it somewhat while it in turn acts as a cooling pool for the water for condensation.

The coal used is the fine rice size obtained by washing the culm banks. It is clean, its only drawback being its size, but as the grates are suited to it, an evaporation of about 8.3 lbs. of water per pound of coal from and at 212 deg. Fahr. is obtained. An average analysis of this coal would run about as follows:

Moisture	1.96 per cent.
Volatile combustible matter	9.24 "
Fixed carbon	72.69 "
Ash	16.11 "

The coal is brought to the plant in hopper bottom cars



Allis-Chalmers Turbo-Generator; Hampton Power Plant of the Delaware, Lackawanna & Western.

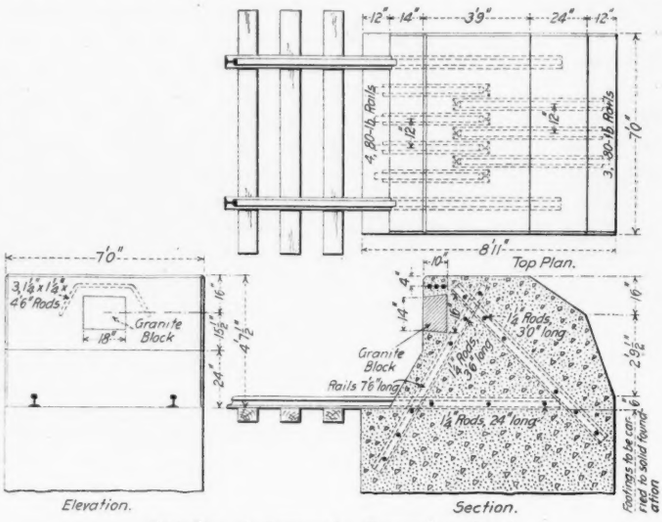
from which it is dumped into a hopper between the tracks. It then flows to a double belt conveyor and is carried up, on an incline, and over the line of hoppers extending the entire length of the boiler house. These hoppers, as well as the receiving one and the incline, are built of reinforced concrete. The average capacity of the boiler house hoppers is 1,000 tons, about 800 tons being usually kept on hand. From the hopper the coal flows by gravity to the stokers. The arrangement of these overhead hoppers and the coal feed pipes, as well as the general arrangement in the boiler room, is shown in one of the engravings. In the case of the hand fired Sterling boilers the coal falls through 8-in. pipe to the floor and is handled from there to the grates.

The ashes are handled by an air blast, the ash pan of each blower being connected with a conveyor pipe leading to a large square reinforced concrete tank, raised above the tracks outside of the building. From the top of this tank a galvanized iron pipe passes through into a dust separator and thence to a Root positive blower, which is capable of exhausting the air from the tank and reducing the pressure to about two lbs. per square inch. The blower is driven by 11-in. x 10-in. engine at a speed of 220 r.p.m. By opening the connection between the ash pan and the pipe a strong blast carries the ashes to the tank or bin. Being wet down, very little dust is raised and that is caught in the separator above. The capacity of the tank is about 50 tons. At the bottom there is a hopper chute discharging into the cars beneath. This conveyor is in operation only while the fires are being cleaned, at which time the several ash pans are connected with it in rotation.

By taking advantage of the existence of this plant the company will be able to deliver power to the new shops at an exceedingly low rate. The cost for fuel will be simply that which it chooses to charge in for the culm, plus the cost of washing. Most of this fuel is not marketable and is that which would not pass inspection. Its commercial value is therefore low, although from a standpoint of its chemical analysis and heat content, it ranks high. The overhead charges will be light, since they will be shared by the balance of the plant, which is furnishing power and steam to the mines. To these two items must be added the interest and depreciation on the machinery, the total of all being a very low figure.

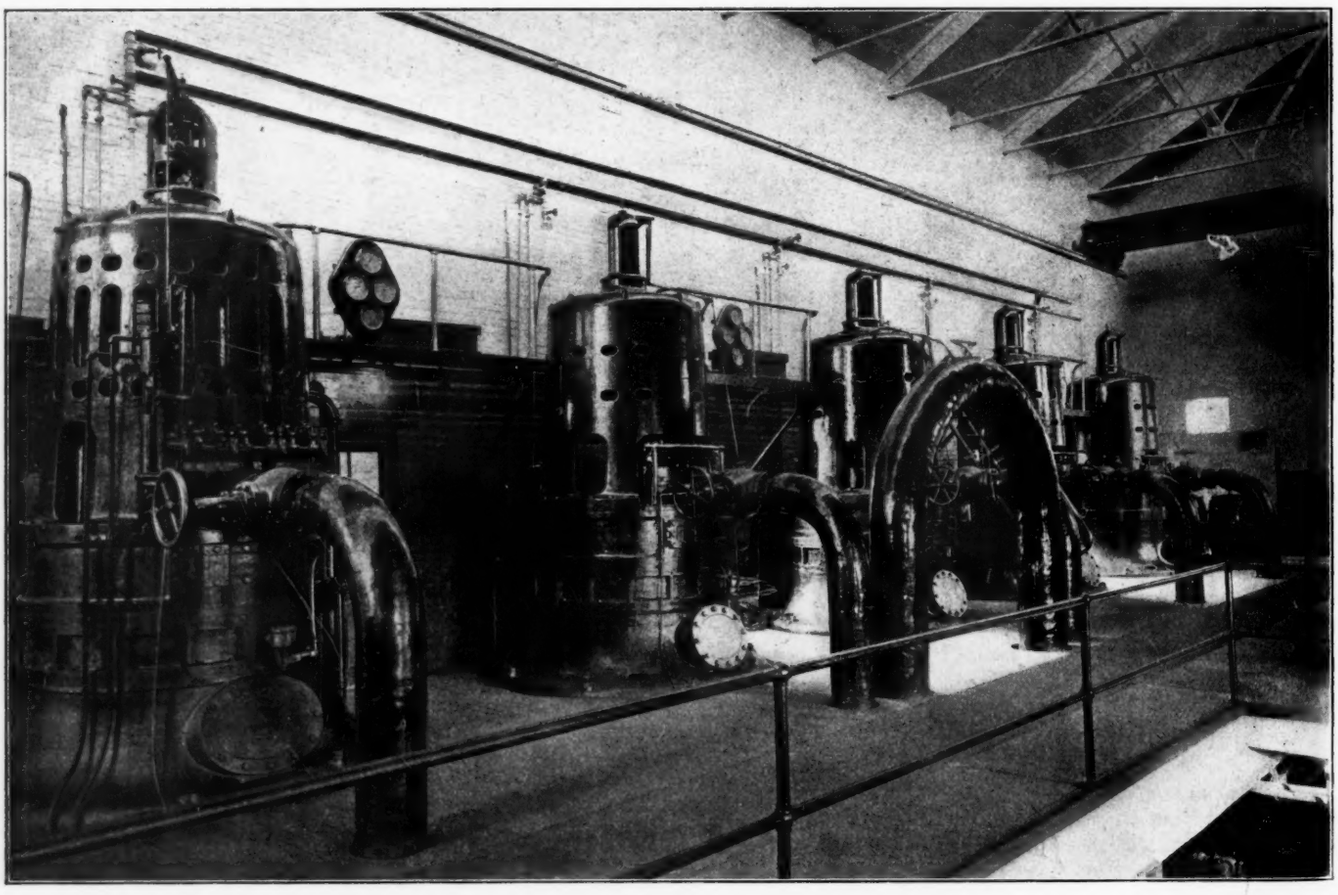
CONCRETE BUMPING POSTS.

The Delaware, Lackawanna & Western has concrete bumping posts in service at several points. They are found to be



Details of Concrete Bumping Post.

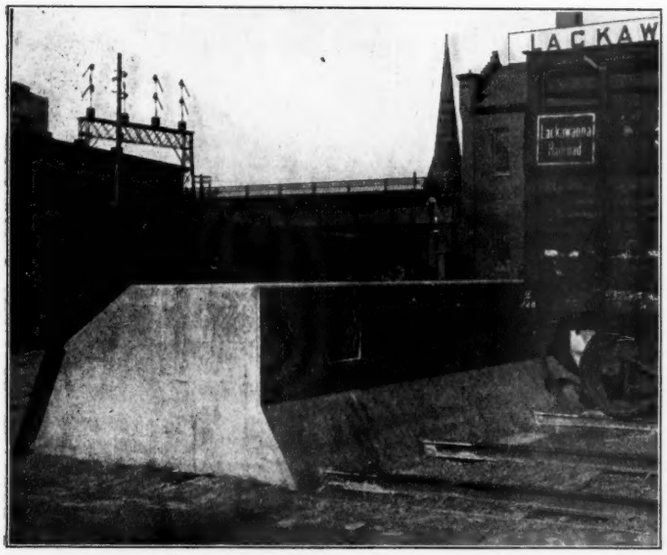
superior to the ordinary posts, both in strength and in durability. They are therefore used where a particularly strong block is required. At other points the ordinary blocks are preferable,



Group of Curtis Turbines; Hampton Power Plant of the Delaware, Lackawanna & Western.

as the effect of the heavy concrete block is to transfer the damage of the blow from the block to the equipment.

The blocks cost about $135 each. It requires a gang of nine men, consisting of a foreman, a carpenter and seven laborers, about four days to make one block.



Concrete Bumping Post; Delaware, Lackawanna & Western.

GENERAL SHOPS OF THE SUD-PACIFICO DE MEXICO AT EMPALME.

The Southern Pacific lines in Mexico consist of the old Sonora Railway, extending from Nogales and Naco on the Mexican border to Guaymas on the Gulf of California, 265 miles, and the new line, Guaymas to Guadalajara, 860 miles. The new shops are located at Empalme, the junction of the old and new lines, which is 5 miles east of Guaymas. An account of the new construction of the roadway will be found in the *Railway Age Gazette*, January 1, 1909.

The shops are complete in every respect, being built to take care of locomotive, passenger and freight car repairing and rebuilding, and are also equipped as a manufacturing plant, making them to a very large extent self-supporting. The walls of the principal locomotive shops are concrete, while the car shops have wooden frames.

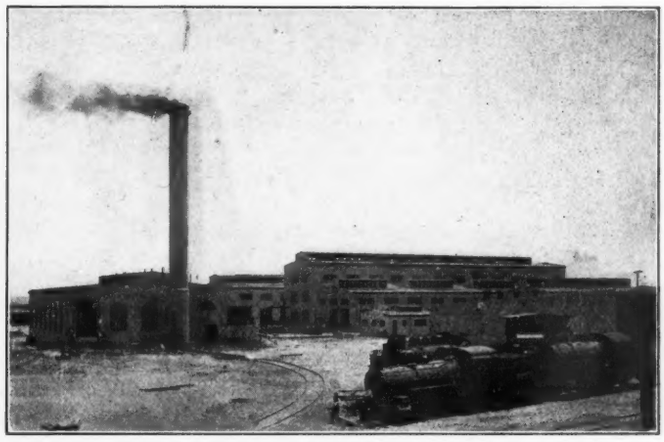
The shops are electrically driven throughout, power being furnished from a central power station, which is a handsome reinforced concrete building, 88 ft. wide and 106 ft. long. This building is divided longitudinally by a wall extending its full length, separating the engine and boiler rooms. The engine room floor is about five feet above the boiler room floor, which provides for a basement to accommodate condenser, air pumps, hot well, boiler washing, general service, hydraulic and fire pumps, steam and exhaust headers and all piping.

The equipment in the power house consists of four 260 h.p. Sterling water tube boilers, set up in two batteries, which are connected by a breeching to a self-supporting, reinforced concrete stack, 6 ft. 6 in. diameter inside by 125 ft. high; two Fleming Harrisburg 14 in. x 28 in. x 18 in. tandem compound condensing engines, direct connected to Westinghouse d.c. generators, 220 volts; and two Ingersoll-Rand compound condensing air compressors of 1,200 cu. ft. of free air capacity.

In the basement are located air pumps, etc., necessary for a compound condensing plant. Coal is dumped from cars into a hopper outside of the building, so arranged as to deliver it in front of each fire door. In addition to providing power and light for the shops, light is furnished for the town of Empalme and all company buildings. Sufficient space has been provided for an additional battery of boilers, an additional engine and generator and an air compressor.

MACHINE AND ERECTING SHOP.

The machine and erecting shop is 161 ft. wide and 264 ft. long, and belongs to what is called the "Transverse Type." The erecting side is 65 ft. 6 in. wide and 50 ft. high, and is served with a 100-ton Niles traveling crane, set high enough to carry a locomotive well over the top of the highest locomotives. The machine side is 65 ft. 6 in. wide and 29 ft. high, and is served by a 15-ton Niles crane running the full length of the shop.



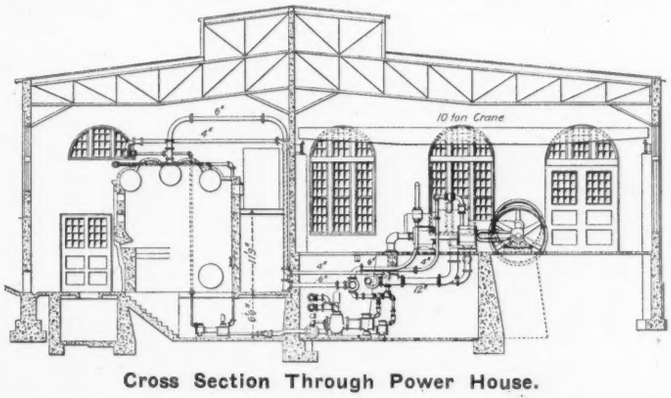
Locomotive Shop and Power House.

The machine side is equipped with the latest machine tools for handling locomotive and manufacturing work, and, with the exception of the tool room group and a group of small lathes, which are each driven by a separate motor, the tools are all independent-motor driven.

The shop is provided with compressed air, general service water and hydraulic pressure pipes with connections and extension and electric cord sockets, located at convenient places.

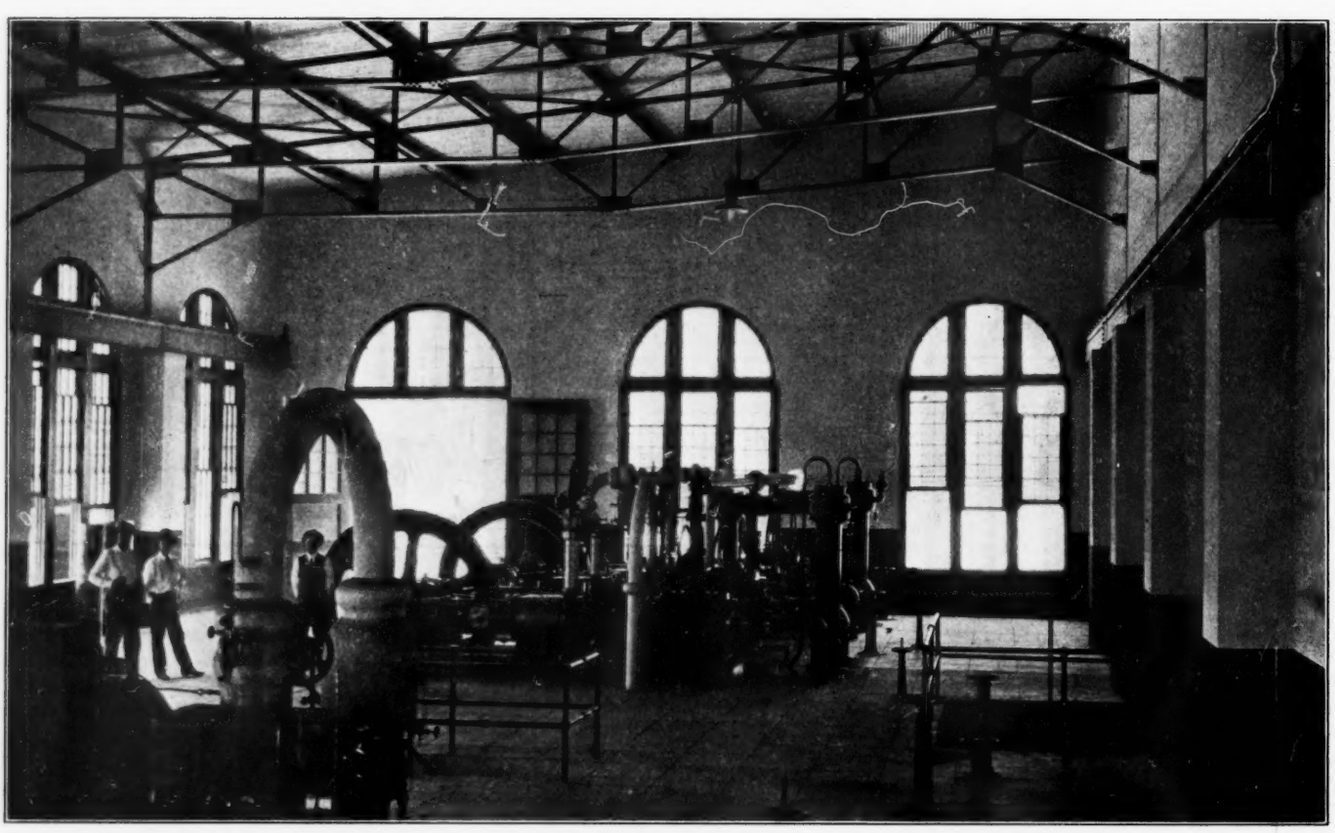
BOILER AND BLACKSMITH SHOPS.

The boiler and blacksmith shops are under one roof, and parallel to the machine shop. The building is 121 ft. wide and 264 ft. long. A wooden partition at the center of the length separates the two shops, and a row of columns divides the shops longitudinally into two bays, providing an erecting and a machine bay in the boiler shop. The erecting bay is served with a 50-ton Niles crane, and the machine bay by a 15-ton crane. The machines are individual-motor driven, and are so arranged that boiler sheets brought in the end door pass along through the different machines to the erecting floor without doubling back. Flanging is done by a Chambersburg sectional flanger, which is served by a 2-ton self-supporting crane. The blacksmith shop is equipped with suitable steam hammers, cranes, and a bloom furnace on which is erected a locomotive

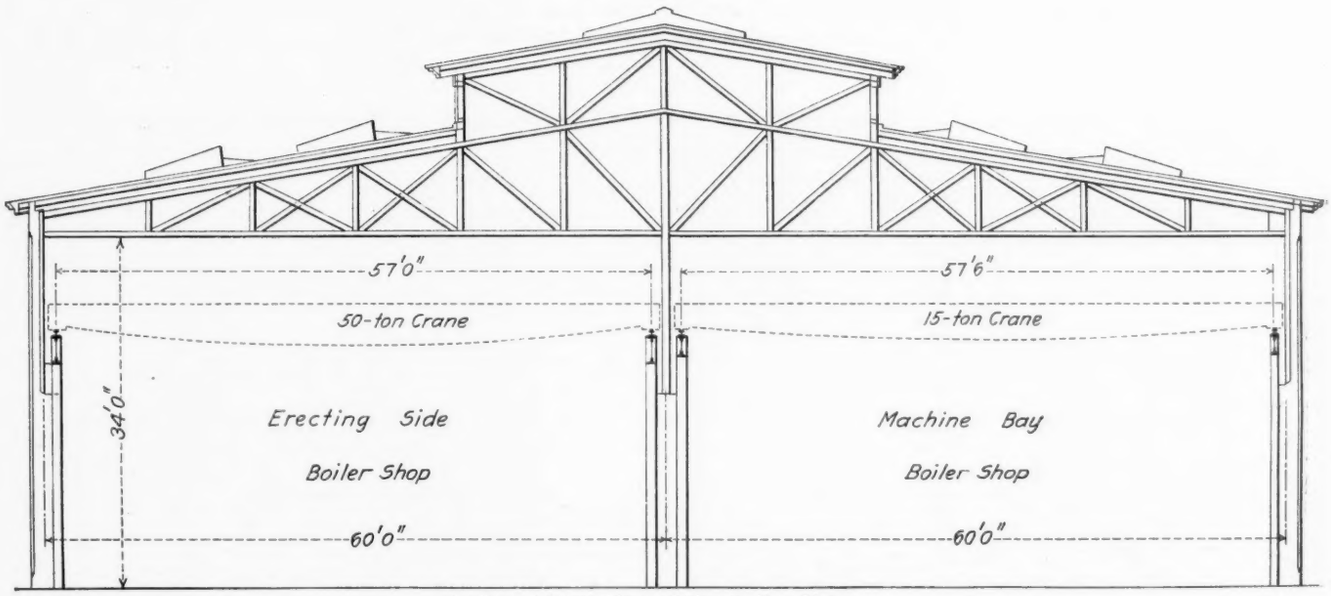


Cross Section Through Power House.

Locomotive Machine Shop; Empalme Shops.



Engine Room of Power House.



Sectional Elevation of the Boiler Shop.

type boiler to furnish steam for the hammers.

MATERIAL SHED AND BOLT SHOP.

Back of and parallel to the boiler and blacksmith shop is the material and bolt shop. In this building is stored all bar iron, boiler steel, flues, rivets, etc., and in it are located the bolt headers, bolt cutters, bulldozers, etc. On the side farthest from the boiler shop is the unloading track. Boiler steel is stored in one end of the building and is handled by an electric-driven crane, the runway of which extends out over the unloading track, picking up material direct from the cars and setting the different size sheets in spaces provided. On the side next to the boiler shop is provided a push car track connecting with the boiler, flue and blacksmith shops by turntables; the crane runway extending out over this track also.

The flue shop is located at the south end of machine shop and is connected with all pit tracks in machine shop and with the boiler and material shops by push car tracks with turntables and floor air jacks. The shop is equipped with necessary flue welders, cutters, and a Ryerson flue rattler, arranged so that a set of flues coming from any shop is taken direct to the rattler on cars provided for that purpose and the entire set picked up at one time, thus avoiding the handling of each flue as is necessary with other rattlers.

FOUNDRY.

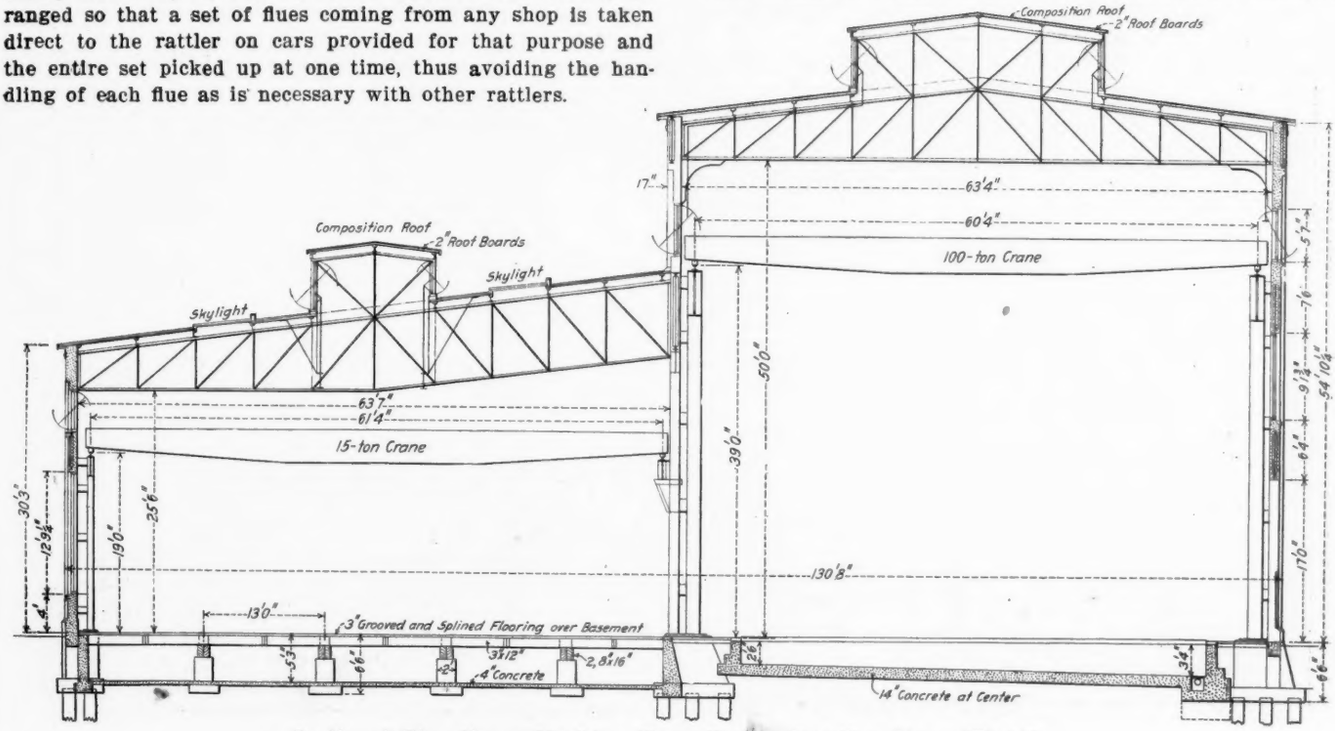
The gray iron and brass foundries are under one roof and provided with all necessary labor-saving conveniences, tracks, turntables, moulding machines, etc. The pattern shop is a two-story fireproof concrete building, located conveniently to the foundry, and is equipped with all necessary individual-driven wood working tools. The second floor of this building is used as a pattern storage.

CAR AND PAINT SHOPS.

The car and paint shops are separate buildings, parallel with one another, with a transfer table between them. These shops are fitted up to handle all passenger car work and rebuilding.

In one end of the car shop is located the car wheel shop, fitted up with all necessary machine tools for handling car work. The mill is located parallel with and next to the car shop, and is equipped with wood working tools suitable for handling freight, passenger car and manufacturing work.

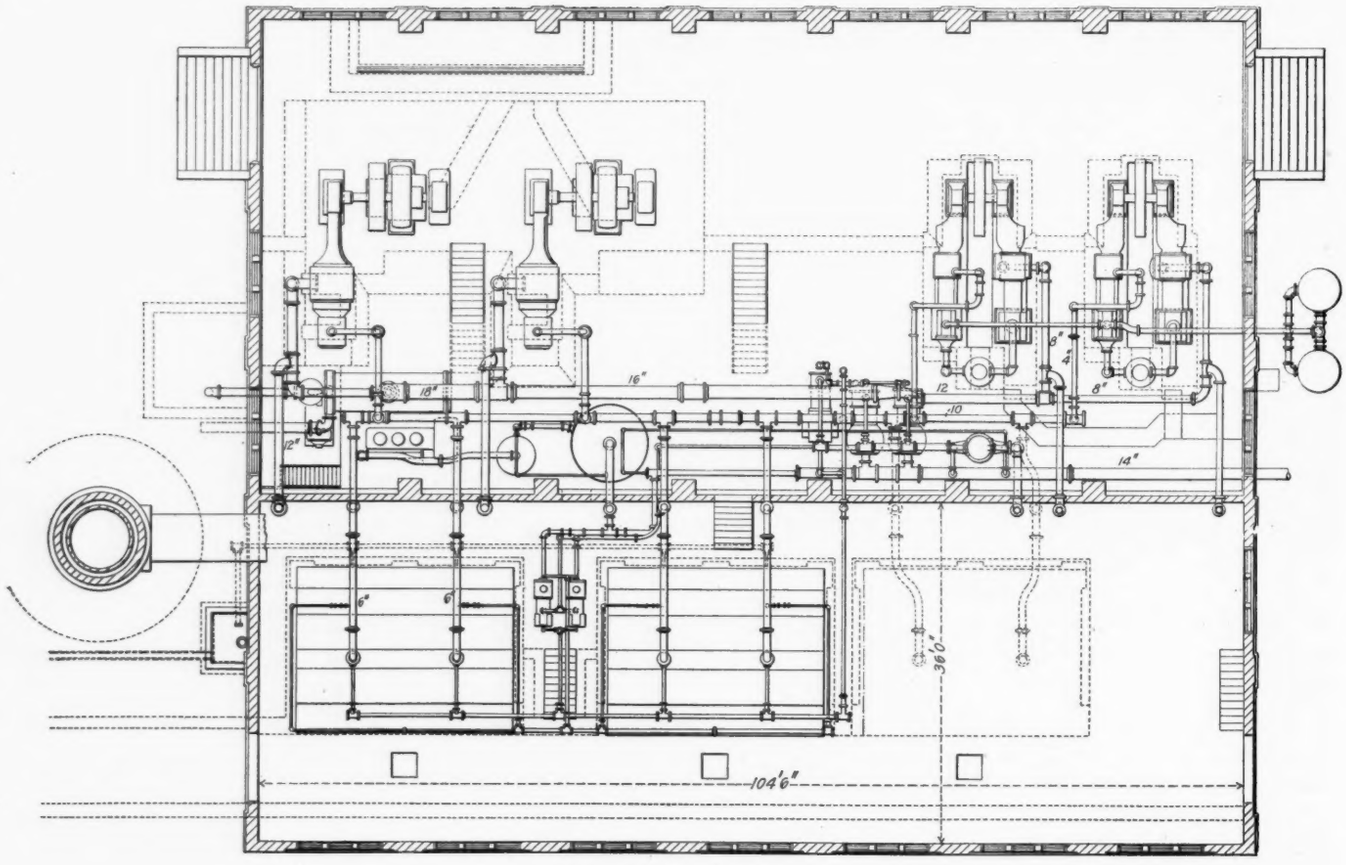
The freight car repair tracks are located directly south of



Sectional Elevations; Machine Shop (Left), Erecting Shop (Right).

and at right angles to the car shops and mill, and connected with the different shops by suitable push car and wheel tracks.

over three tracks with a runway extending 250 ft. outside of the building. The shop is equipped with machine tools, fires, formers, etc., necessary for this class of repairs.

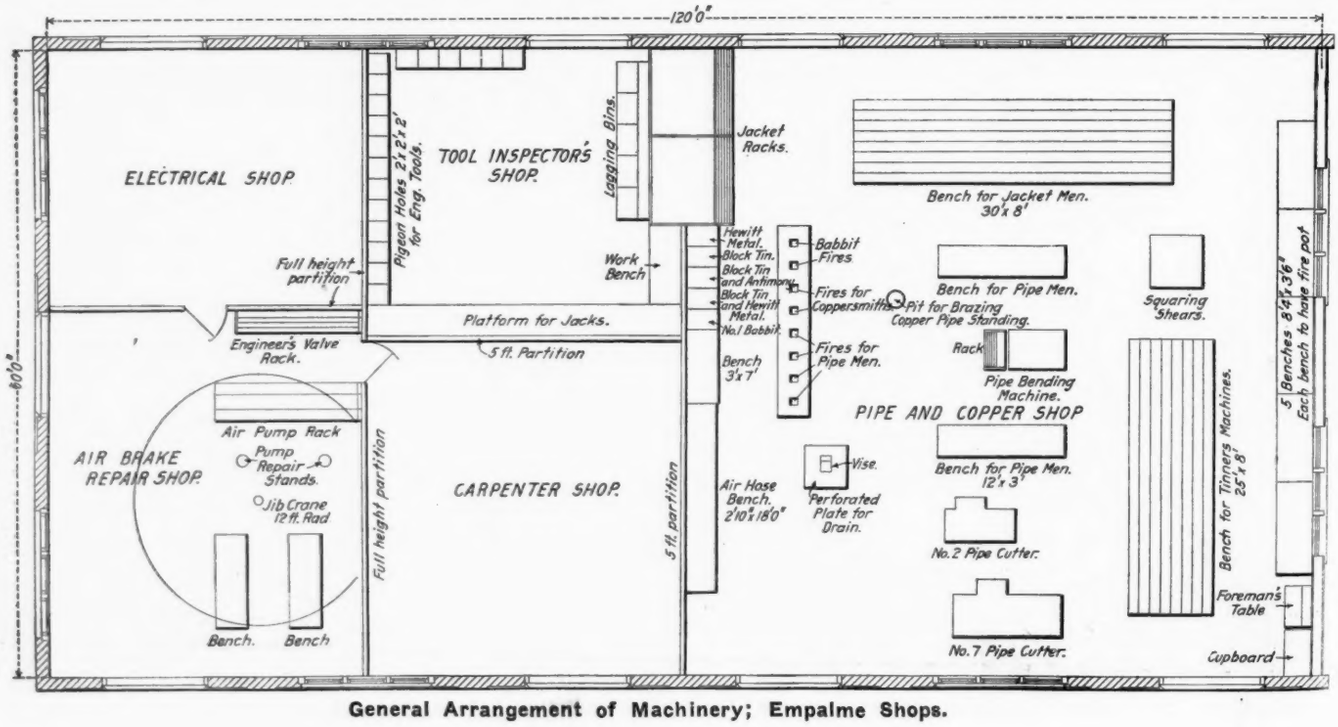


Plan of Power House.

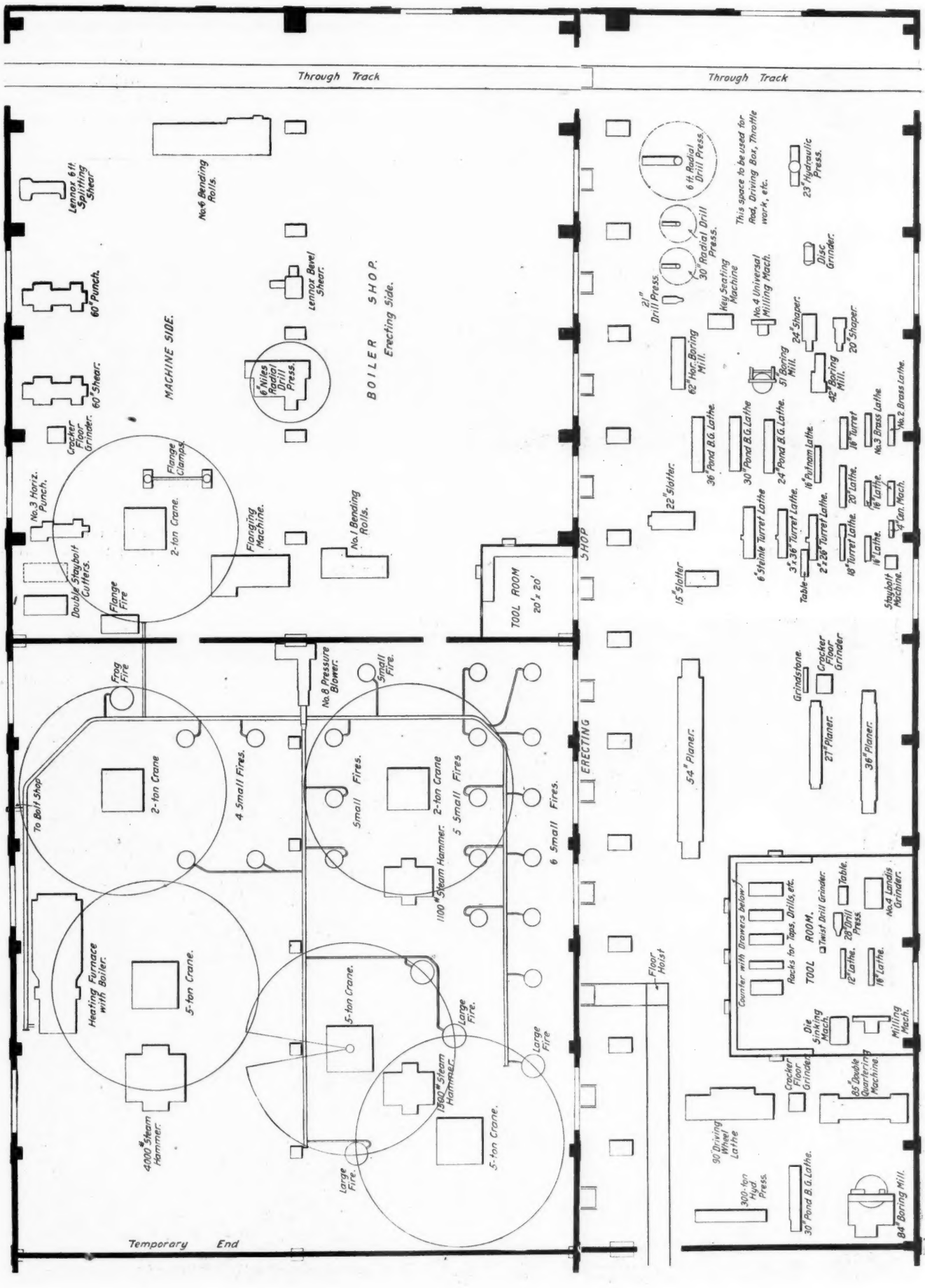
A steel car repair shop and blacksmith shop is located alongside of and connecting with the repair tracks. In this building is handled all repairs to steel cars and all car blacksmith repair work. It is provided with an electric crane extending

A car shop store, in which car material exclusively is kept, is located at the end of and between the car shop and repair tracks.

Lumber storage with suitable unloading tracks and push



General Arrangement of Machinery; Empalme Shops.



General Arrangement of Tools; Forge Shop, Boiler Shop and Machine Shop, Empalme Shops.

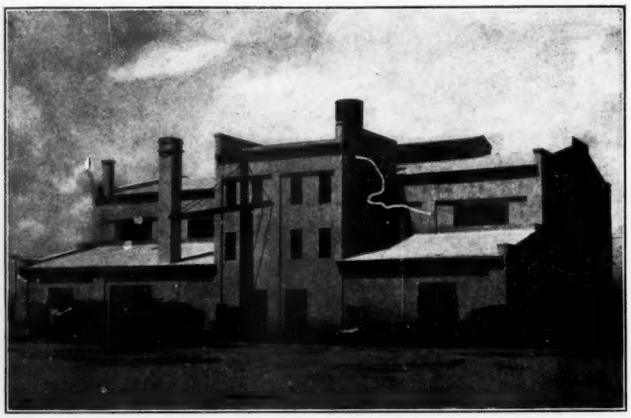
car tracks connecting with the mill, car shops and repair tracks, is located at the north end of the mill.

Plans are now completed for a dry lumber storage building and a dry kiln and erection is about to be started.

Interior of Foundry.

Special attention has been paid to light, and all buildings are exceptionally well lighted. To eliminate the disagreeable feature of the strong sunlight of Mexico, factory ribbed glass is used throughout.

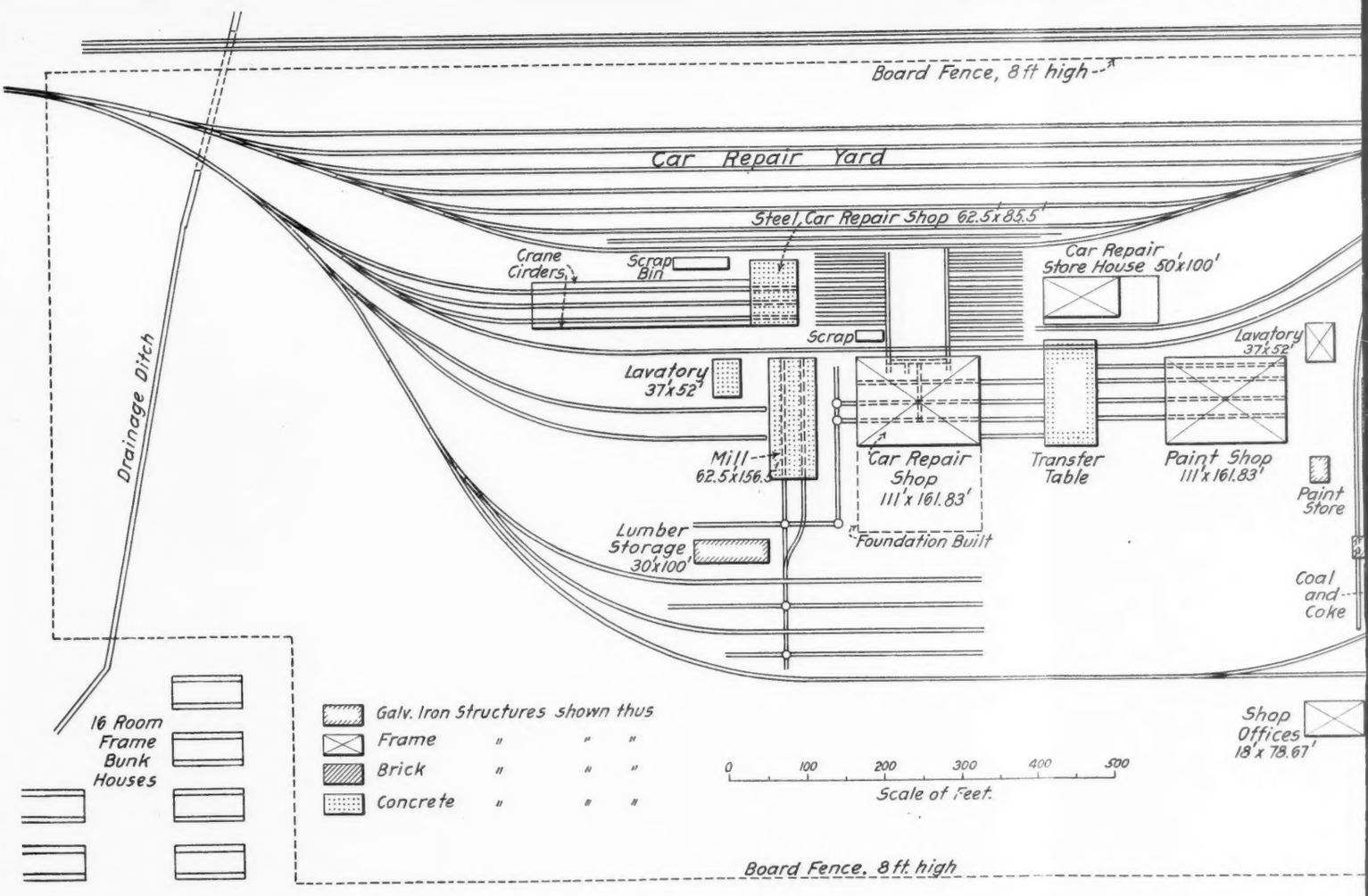
Particular attention has been given to labor and time-saving devices. Cranes, push car tracks, turntables, floor air jacks, air hoists, etc., have been provided wherever considered practical, and a telephone system connecting all shops, offices and stores is installed. A general fire alarm system with fire alarm boxes located at suitable places about the shops and connecting with the power-house, is provided. An independent fire line with hydrants has been installed, and is used only in case of fire or fire drill by the shop fire department, thus insuring piping in good condition that will stand high pressure in case of fire, and eliminating the dangerous practice of allowing general service and other taps to be connected to the fire line, which ordinarily bursts when it is subjected to a good pressure.



Exterior of Foundry.

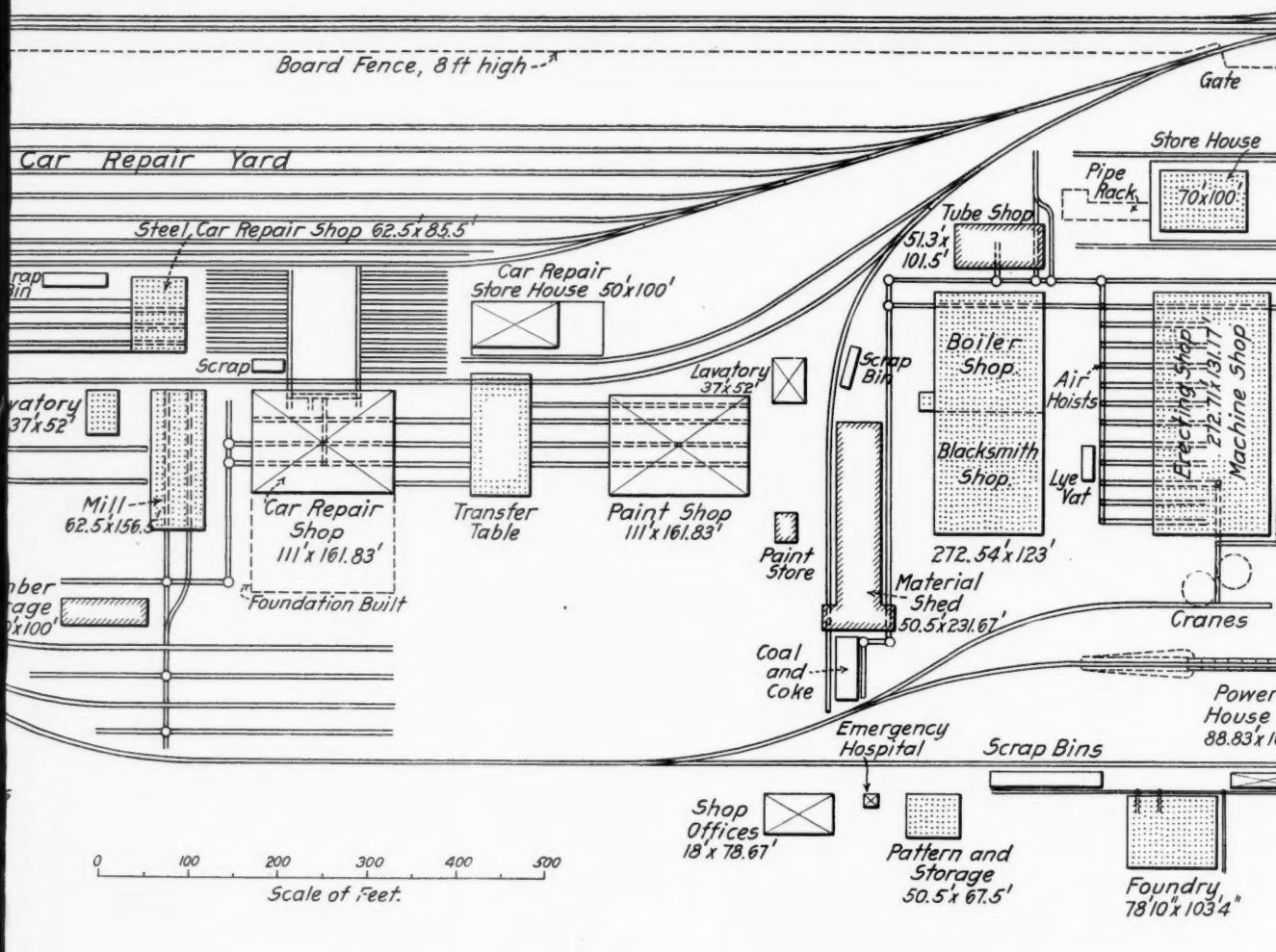
Erecting Shop, Empalme Shops.

SOUTHERN PACIFIC SHOPS AT EMPALME

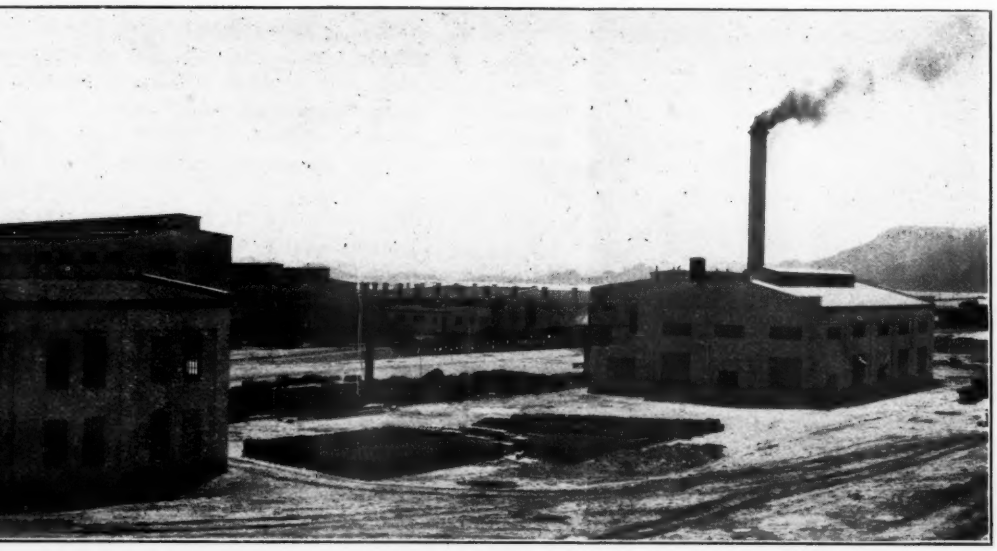


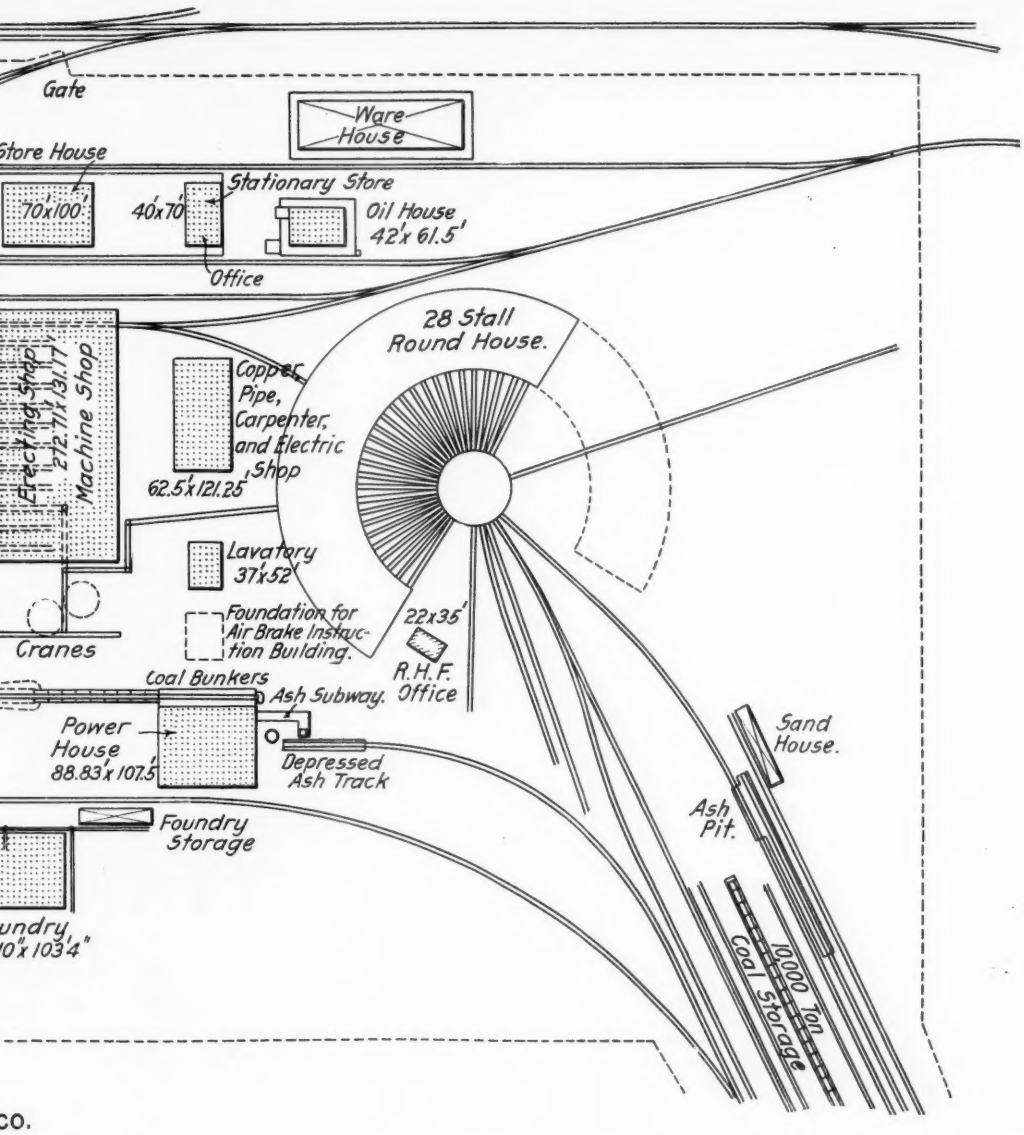
GENERAL LAYOUT; SOUTHERN PACIFIC SHOPS AT

SOUTHERN PACIFIC SHOPS AT EMPALME, SONORA, MEXICO.



GENERAL LAYOUT; SOUTHERN PACIFIC SHOPS AT EMPALME, SONORA, MEXICO.




Gate
Ware House
Store House
70'x100'
Stationary Store
40'x70'
Oil House
42'x 61.5'
Office
28 Stall Round House.
Copper, Pipe, Carpenter, and Electric Shop
62.5'x121.25'
Lavatory
37'x52'
Foundation for Air Brake Instruction Building.
22'x35'
R.H.F. Office
Cranes
Coal Bunkers
Ash Subway.
Power House
88.83'x107.5'
Depressed Ash Track
Sand House.
Ash Pit.
Foundry Storage
10000 Ton Coal Storage

co.

THE NEW HEINE BOILER SHOP.

The Heine Safety Boiler Company, St. Louis, Mo., recently completed a new shop which is a good illustration of a modern factory devoted exclusively to the manufacture of water tube boilers. The buildings consist of a main shop with a wing for a flange shop, the power house, toilet and wash rooms and general office, making a total of 2½ acres of floor space. The relative locations of these buildings are shown in the illustrations.

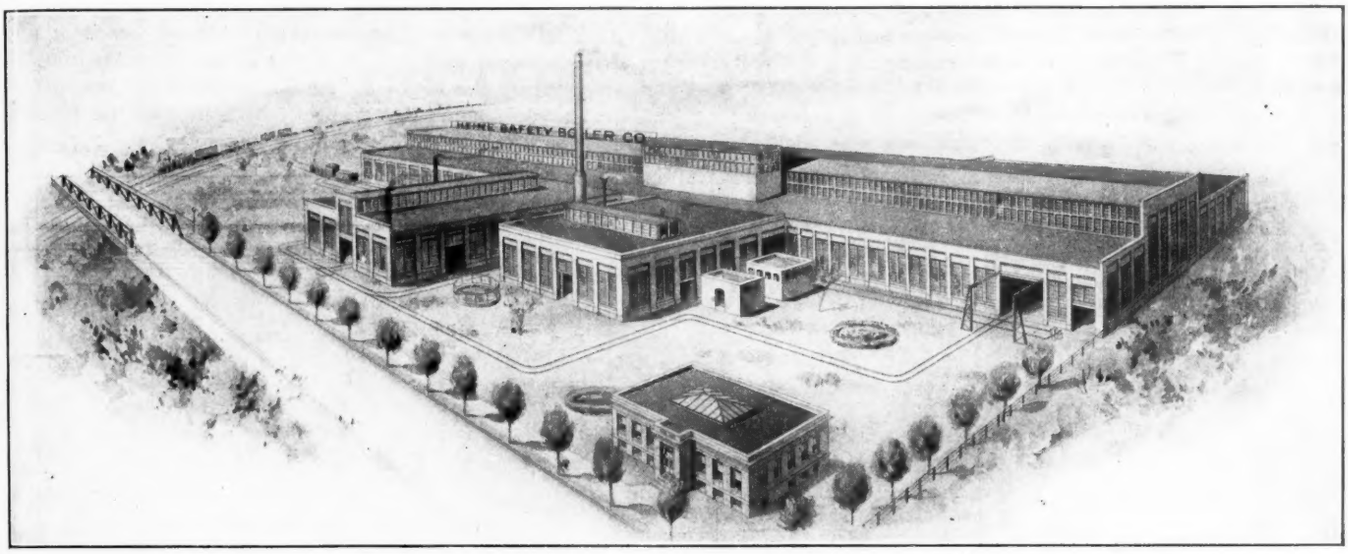
The raw material is received at one end of the large building which is used as a storage room, and it passes without reversal to the opposite end, where completed boilers are stored and shipped. Tubes not being needed until boilers are assembled are received and stored at the shipping end. The whole floor area of both the main and the flange shop is served by small and large traveling cranes, while a 24-in. gage industrial railway, made by the Arthur Kopple Co., Pittsburgh, Pa., completely encircles these structures and has connection with the interior.

For the operation of the equipment, electric, hydraulic and pneumatic power is employed, and the power house is placed in close proximity to the hydraulic and pneumatic tools in order to reduce the length of the transmission lines, thus saving in first cost frictional loss and maintenance. The majority of the tools are electric-driven by individual Wagner motors.

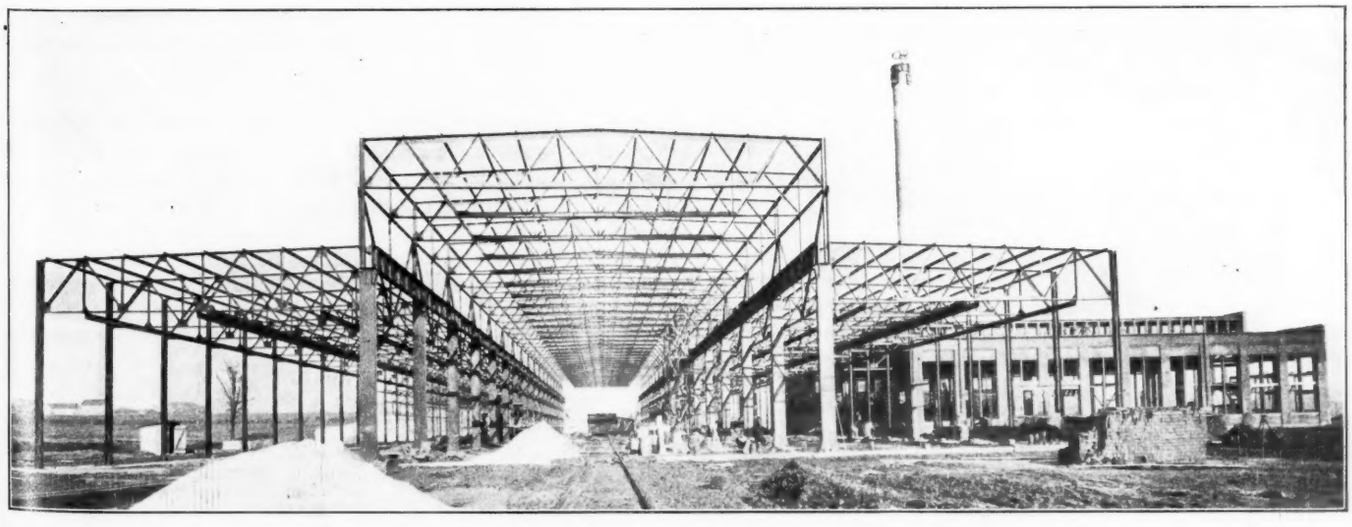
A drainage system is provided into which all rain water from the roof, as well as clean waste from manufacturing, is discharged into a large cement-lined cistern 20 ft. in diameter and 20 ft. deep, near the power house. As the only source of water supply is from the city mains, this arrangement effects a very appreciable economy.

The buildings are of steel frame construction with outside walls of brick and reinforced concrete slab roofs. About 75 per cent. of the vertical areas is glass. The main shop is 450 ft. long, 143 ft. wide for 250 ft. of its length, and 180 ft. wide for the remaining 200 ft. The narrow portion is divided into three longitudinal bays, the middle one 50 ft. and the two side ones 41½ ft. wide.

The central bay is supplied with a 25-ton traveling crane, and this bay is 14 ft. higher than the side bays. About the middle of the side toward the power house is a riveting tower 24 ft. wide, its roof being 55 ft. above the floor In the side walls the middle sash is stationary, and the upper and lower sash are arranged so that they can be raised and lowered vertically. They counterbalance each other through steel chains over special pulleys. In the monitor the lower row of sash is stationary, and the upper sash are arranged so that they can be opened for ventilation. A special door, 22 ft. 2 in. wide



General View of Heine Boiler Shop.

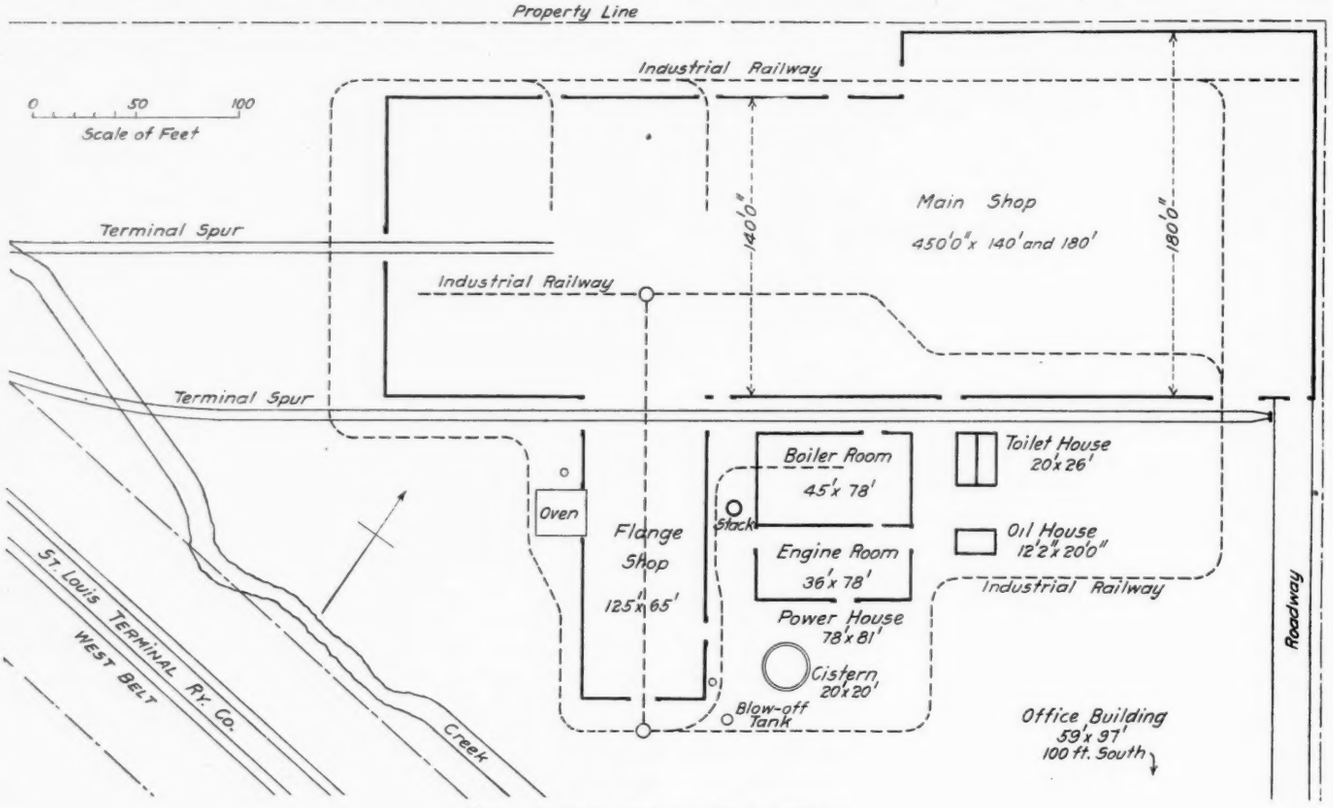


Steel Framing of Main Shop.

x 20 ft. high, is located in the receiving end, and through this is carried a transverse craneway projecting outside of the building and over the receiving tracks. It connects with the longitudinal cranes on the inside, thus permitting unloading material from cars expeditiously and cheaply.

The flange shop, 62 ft. 4 in. x 144 ft., is similar in construction to the main building. Large door openings are placed in the side walls, through which the receiving switch passes. These openinsg are closed by rolling steel doors made by the Kinnear Manufacturing Co., Columbus, Ohio. The power house, 75 ft. x 79 ft., is divided by a brick wall near the center into an engine room and a boiler room. A three-ton traveling crane, made by the Yale & Towne Manufacturing Co., New York, is located on a transverse craneway at the storage end of the main shop. This is used to place boiler plate, the heaviest material received, directly into a series of racks, which hold the plates in vertical position so that they may be withdrawn without unnecessary handling.

The side bays are each served by four three-ton Curtis traveling cranes, with hand-operated triple blocks. This shop is supplied with a full complement of boiler-making tools, most of which are motor-driven. The flange shop is also supplied with heavy hydraulic tools for punching and flanging, and the floor is served by four three-ton Curtis traveling cranes. All the small traveling cranes in both shops on adjacent parallel tracks overhang their runways so as to be locked together, and the trolleys run from one to the other.



General Plan of Heine Boiler Plant.

The equipment in the boiler house consists of three 250-h.p. Heine boilers each set separately, two of them being provided with Heine superheaters of different capacities. They are all hand fired and have flat shaking grates. The third boiler has a concrete setting with fire brick lining, which is an experiment to determine the availability of concrete for this purpose. The three boilers differ from each other in dimensions and are all arranged so that observations can be made in testing, as the company has in view a great variety of experiments to determine questions now in doubt and to develop further improvements in boiler practice. The electric power is developed by a 162-h.p. Ball engine directly connected to a 100-k.w. Western Electric Co., New York, generator. A Laidlaw-Dunn-Gordon two-stage compound air compressor is located next to the engine. It has a capacity of 1,200 cu. ft. of free air per minute at 100 lbs. pressure. The hydraulic system is supplied by a Worthington duplex compound pump having a capacity of 100 gal. per minute against 1,500 lbs. pressure. A Wood hydraulic accumulator with 12-in. ram and 15-ft. stroke, loaded for this pressure, is located in one corner of the room. A 10-ton hand-power traveling crane, 33½-ft. span, made by Pawling & Harnischfeger, Milwaukee, Wis., serves the entire area of the engine room. The steel construction was purposely undertaken at a time of business depression so that low prices could be obtained, and the work was commenced early in 1908. The grading was completed in July, 1908, and 18,000 cu. yds. of earth were excavated at a cost of 16 cents per yard. This work and the retaining walls were executed by the Fruin & Colnon Constructing Company. The steel work, amounting to about 790 tons, was furnished by the Ritter Conley Manufacturing Company at the rate of 2.6 cents per pound, f.o.b. St. Louis. It was all inspected by Robert W. Hunt & Company, New York, before leaving the factory. The steel work was erected by the Midland Erection Company at the rate of $8.80 per ton, and the general contract for the completion of the main shop and power house was given to the Fruit & Colnon Constructing Company. The total cost of the buildings was $1.15 per sq. ft. of floor area, excluding the retaining walls and grading, and $1.29 per sq. ft. including these two items. This, of course, does not include any of the equipment. The whole work of constructing the shop was under the direct supervision of H. C. Meinholtz, vice-president and superintendent of the Heine Safety Boiler Co.

Main Shop Tools.

1 Ryerson high-speed friction saw, 30-h.p. motor.
1 24-in. Kraut punch, 7½-h.p. motor.
1 36-in. Cleveland punch, 7½-h.p. motor.
1 8-ft. Lennox splitting shears, 7½-h.p. motor.
1 60-in. Cleveland punch and shear, 10-h.p. motor.
1 Lennox rotary bevel shear, 7½-h.p. motor.
1 14-ft. Hilles & Jones bending roll, 10-h.p. and 30-h.p. motors.
2 100-ton Woods triple-power hydraulic riveters.
1 30-in. Long & Allstetter horizontal punch, 7½-h.p. motor.

The three last machines are located under the riveting tower and are served by three 10-ton Wood hydraulic tower traveling cranes with 40-ft. lift and 20-ft. 7-in. span. Provision is also made for an additional riveter.

2 5-ft. radial drills belted from a shaft driven by a 10-h.p. motor.
1 Wood portable hydraulic riveter, handled by the hydraulic hoist in the 30-in. horizontal punch tower.
1 25-ton Pawling & Harnischfeger electric traveling crane, 26½-ft. lift, 60-ft. span with 5-ton auxiliary hoist; General Electric motors for all movements.
An outfit of pneumatic calking, riveting and chipping hammers.
1 Angle bending roll, 10-h.p. motor.
1 Sheet-iron break, 7½-h.p. motor.
1 42-in. Lennox rotary splitting shears, 7½-h.p. motor.
1 36-in. Kraut punch, 7½-h.p. motor
1 8-ft. Hilles & Jones bending roll, 10-h.p. motor.
2 6-in. Cleveland punches belted to a counter shaft driven by a 7½-h.p. motor.
1 6-ft. Hilles & Jones bending roll.
1 24-in. Long & Allstatter punch.
These two latter are belted to a countershaft driven by a 7½-h.p. motor.

The machine shop equipment is mainly belt-driven by a 20-h.p. motor through a line shaft. There are four lathes of various sizes, one shaper, one universal milling machine, three different sizes of radial drills, one planer, one heavy duty motor-driven boring mill, one double head bolt cutter, two pipe-threading machines, a combination grinder, one wet grinder.

Flange Shop Tools.

1 180-ton, 60-in. Wood hydraulic punch and shear.
1 130-ton, 60-in. hydraulic sectional flanging machine.
1 1,100-lb. Niles-Bement-Pond steam hammer.
1 10-in. Long & Allstatter horizontal punch, 7½-h.p. motor.
1 250-lb. Niles-Bement-Pond steam hammer.
2 2-ft. 10-in. x 14-ft. hearth open forge fires.
1 2-ft. 10-in. x 6-ft. hearth open forge fire.
1 4-ft. 3-in. x 6-ft. hearth reverberatory forge furnace.
1 10-ft. 6-in. x 15-ft. 6-in. hearth reverberatory plate heating furnace.
3 Blacksmith forges.
1 24½-in. motor-driven blast fan and pipe connections to forger.
1 Cast iron plate-straightening bed and roller.
Complete set of cast iron forming blocks, dies, etc., to suit the special requirements of the type of boiler built by this company.
4 3-ton Curtis traveling cranes.

NEW YORK TUNNEL EXTENSION OF THE PENNSYLVANIA RAILROAD; CROSSTOWN TUNNELS.*

BY JAMES H. BRACE AND FRANCIS MASON, MEMBERS, AM. SOC. C. E.

III.

Thirty-second Street Open-Cut Work.—Before actual open-cut excavation was started, all buildings facing it were underpinned to rock. For this purpose, a trench was dug along the face of the buildings and of the same depth as their cellars. Holes were cut in the front foundation walls through which long needle-beams were inserted and jacked up on blocking placed on the cellar floor and in the trench, until the weight of the building had been taken off its foundations. A close-sheeted trench was then sunk to rock under the front building walls, and a light rubble masonry retaining wall was built in it to support the building permanently. Frequently, the excavation for the underpinning wall, which was taken out in sections from 30 to 40 ft. long, and in places was carried to a depth of 40 ft., was very troublesome on account of the large quantity of water encountered and the fineness of the sand, which exhibited a tendency to flow when saturated.

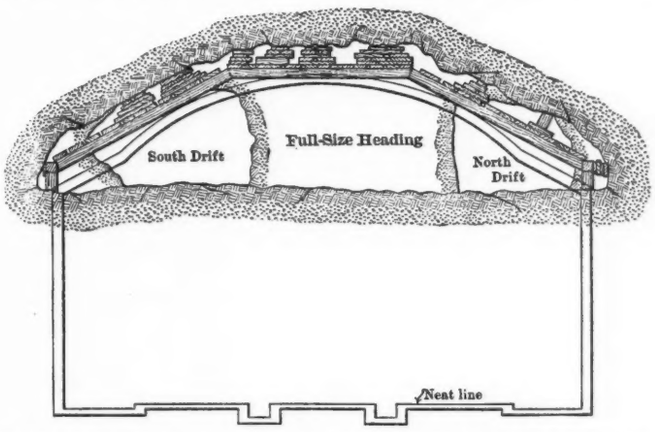
The elevated railway columns in Sixth avenue, near the north and south lines of Thirty-second street, were underpinned in a manner similar to the building foundations, while those on the center line of the street were supported by girders riveted to them close under the track level. The girders in turn were supported on posts footed on the new underpinning of the adjacent columns. On the completion of the tunnels, concrete piers were built up from the roof of the tunnel to form a permanent foundation for the center-line columns. The area to be excavated under Sixth avenue was enclosed by a rubble masonry retaining wall constructed in a trench.

Open-cut excavation was started by planking over the street on stringers resting on transverse 12-in. x 12-in. caps. The caps were gradually undermined and supported on temporary posts which were then replaced by short posts resting on 12-in. x 12-in. sills about 7 ft. below the cap. The operation was then repeated and the sill was supported on another set of short posts resting on a second sill. When the excavation had been carried down in this manner to the level of the top of the tunnel, diagonal 3-in. x 10-in. timbers were cut in between the posts and sills to form a species of double A-frame, the legs of which rested in niches cut in the rock and on posts carried up the face of the underpinning wall, and the whole was stiffened with vertical tie-rods. The brick sewer was replaced temporarily by one of riveted steel pipe. This pipe and the water and gas pipes and electric conduits were suspended from the timbers as the pipes were uncovered.

Excavation in rock was made by sinking a pit to sub-grade for the full width of the tunnel and advancing the face of the pit in several lifts, the muck being blown over the slope and loaded into buckets at its foot.

The work was attacked at several places simultaneously, and the spoil was hoisted by derricks located at convenient points along the side of the cut.

Thirty-third Street Work in Tunnel and Open Cut.—The West Thirty-third street shaft was similar to the one in Thirty-second street, and was sunk during February, March and April, 1907, through 10 ft. of earth, 21 ft. of soft rock, and 29 ft. of fairly hard rock. It was necessary to timber heavily the upper 30 ft. of the shaft. The timber later showed evidences of severe strain, and had to be reinforced.



North and South Heading and Enlargement to Single Heading; Three-Track Tunnel.

As soon as the shaft excavation was deep enough, a drift was driven part way across the tunnels, and top headings were started both east and west to explore the rock. The heading to the west was divided into two drifts, as shown herewith. These two drifts were continued to the west end of the contract, and were then enlarged to a full-sized heading and timbered, as shown. The rock near the shaft contained many wet, rusty seams, and settlement was detected in the segmental tunnel timbering soon after the widening of the heading was completed. Short props were placed under the timbers, and the street surface was opened with a view of stripping the earth down to the rock and thus lightening the load on the timbering. Street traffic was maintained on a timber structure with posts eventually carried down to the rock surface, and the walls of the buildings on the north side of the street were underpinned to rock. The settlement of the tunnel timbering was checked for a time, and the bench was excavated as shown. In this work the cut in the center was first made, and the short props were replaced by struts, as shown; after this the berms were removed and the side posts were placed. While building the brick arches, holes were left in the masonry around the struts. After the masonry had hardened, piers were built on the arches to

*From a paper presented before the American Society of Civil Engineers on December 1. Published in *Proceedings* for October, 1909, page 1016.

support the segmental timbers. The struts were then removed and the openings filled with masonry. The voids above the arch were packed with rock and afterward thoroughly grouted.

The timbers near the shaft continued to settle, and, although they had been placed from 9 to 12 in. above the level of the top of the masonry, by October 1, they encroached 9 in. within the line of masonry. It was then decided to remove the rock 48 ft. west of the shaft, and build this portion of the tunnel in open cut. The posts supporting the deck forming the street surface were replaced by an A-frame structure similar to that developed for the Thirty-second street open cut, without interruption of the street traffic.

After making the open cut to the westward of the shaft, there was a slip in the rock north of and adpoining the shaft. Fortunately, the timbers did not give way entirely, and no damage was done. The open cut was extended eastward for 46 ft., making the total length of tunnel built in open cut on this street 94 ft.

East of the shaft, for about 125 ft., the rock was broken and could not be excavated to full size without timbering the roof, but between this section of poor rock and those already mentioned in connection with the work at Fifth avenue there was a stretch of 600 ft. of good rock where all the spoil was handled with a steam shovel.

TWIN-TUNNEL LINING.

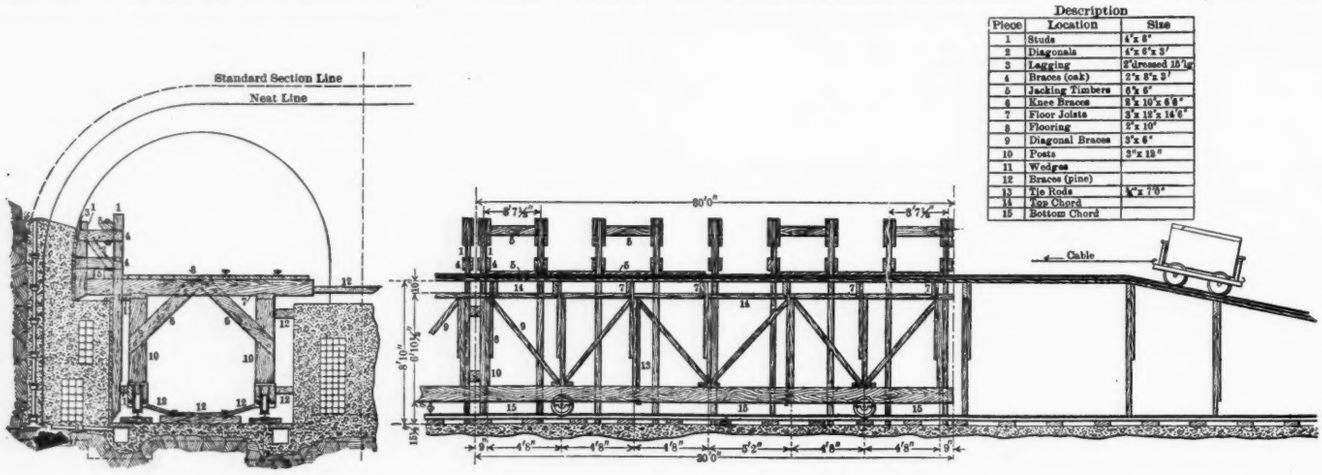
The masonry lining for the tunnels was not started until the late fall of 1906, after excavation had been in progress for a year and a half. At that time concreting was started in the single tunnels westward from the First avenue shafts, and by spring was in full swing in the twin tunnels.

The plans contemplated the use of a complete concrete lining except where large quantities of water were encountered; in which case the arches, beginning at a point 15 deg. above the springing line, were to be built of vitrified paving brick. The water-proofing, which in the concrete-roof tunnels extended the full height of the sides to the 15-deg. line, was carried in the brick-roof tunnels completely around the extrados of the arch. The electric conduits were buried in the mass of the side and core-walls, and limited the height to which the concrete could be carried in one operation.

The same general scheme of operations was used whenever possible throughout the twin-tunnel work, but was subject to minor modifications as circumstances dictated. Concrete was first deposited in the bottom, to the grade of the flow line of the drains; after it had set, collapsible box forms, of 2-in. plank with 3-in. plank tops, were laid on it to form the ditch and the shoulders for the flagstone covers. The track, which had previously been blocked up on the rock between the ditches, was raised and supported on the ditch boxes above the finished floor level. At the same time, light forms were braced from the ditch boxes to the grade of the base of the low-tension and telephone-duct bank. After depositing the concrete to this level, the telephone ducts were laid.

The forms for the water-proofing or sand-wall up to the 15-deg. line and for the main side-walls and core-walls were built in 30-ft. panels and were supported on carriages, which, traveling on a broad-gage track above the ditches, moved along the tunnel, section by section, as the work advanced. The panels were hung loosely from joists carrying a platform on the top chord of the carriage trusses, and were adjusted transversely by bracing and wedging them out from the car riage. The small forms for the refuge niches, ladders, etc., were collapsible, and were spiked to the main panel forms just before depositing the concrete. The concrete was deposited from the platform on top of the carriage, to which the cars were elevated in various ways. The accompanying drawing shows the details of the carriages, and is self-explanatory.

The concrete for the sand-walls and the core-wall, to the level of the sidewalk, was deposited at the same time; two carriages in each tunnel, placed opposite each other, forming a 60-ft. length, were used at each setting. The floor section of the 4-in. tile drains had been laid with the floor concrete, and, as the sand-wall concrete was deposited, the drains were brought up simultaneously, broken stone being deposited between the tile and the rock to form a blind drain and afford access to the open joints of the tile for the water entering the tunnel through seams in the rock. The drains were spaced at intervals not exceeding 25 ft., depending on the wetness of the rock, and were placed at similar intervals in the core-wall under the lowest projecting points of the rock on the center line between the tunnels. A small ditch lined with loose 6-in. vitrified half pipe was provided in the top of the sand-wall to collect the water from the extrados of the arch and lead it to the top of the drains. Great difficulty was experienced in maintaining these drains clear, and, on completion of the work, a large amount of labor was expended in removing obstructions from the floor sections, the only portion then accessible.



Carriage Form for Side Walls; Twin Tunnels.

After water-proofing the sand-walls and laying the low-tension ducts, a second pair of carriages, with panels on one side only, for 60 ft. of side-wall and skewback to the 15-deg. line, were set and braced against the core-wall. They were concreted to the base of the high-tension duct bank, and, after the concrete had hardened and the bank of ducts had been laid, the concreting was completed in a second operation.

In places where the roof was supported temporarily by posts and heavy timbering, such as Fifth avenue, the form carriages could not be used, and special methods were devised to suit the local conditions. Usually, the panels were stripped from the carriages and moved from section to section by hand, and, when in position, were braced to the timbering.

The arch centers were built up of two 5-in. x 3-in. x ⅜-in. steel angles, and, when set, were blocked up on the sidewalks opposite each other in the two tunnels. A temporary platform was laid on the bottom chord angles of the ribs, on which the concrete was dumped, the same as on the form carriages. The lagging used was 3-in. x 3-in. dressed pine or spruce 16 ft. long, and was placed as the concreting of the arch proceeded above the 15-deg. line on the side-wall and above the sidewalk on the core-wall. After the arch had reached such a height that the concrete could not be passed over the lagging directly from the main platform, it was cast on a small plaform on the upper horizontal bracing of the centers, and was thence shoveled in to the work. In the upper part of the arch the face of the concrete was kept on a radial plane, and, when only 3 ft. remained to be placed, it was keyed in from one end, the key lagging being set in about 5-ft. lengths. The arches were concreted usually in 60-ft. lengths.

Where brick arches were used, the core-wall skewback was concreted behind special forms set up on the sidewalks, or the arch ribs and lagging were used for forms, and the brick arch was not started until after the concrete had set. In laying the brick in the arch, the five courses of the ring were carried up as high as the void between the extrados and the rock would permit and still leave a working space in which to place the water-proofing. This was usually not more than 3 ft., except on the core-wall side. The felt and pitch water-proofing was then laid for that height, joined to the previous water-proofing on the side-walls, and was followed by the brick armor course over the water-proofing and by the rock packing, after which another lift of brick was laid and the operations were repeated. The large void above the core-wall gave convenient access for working on top of the adjacent sides of the roof, and the keying of the arches and the water-proofing and rock packing above the core-wall were usually carried on from that point, the work progressing from one end.

The concrete for all work above the floor was dumped on the platform of the carriages, to which it was transported in the early part of the work in cars running on a high-level track laid on long ties, resting on the finished sidewalks. This arrangement, although requiring a large amount of timber for the track, permitted the muck to be carried out on the low-level track without interference. Later, when the advance of the heading had ceased and the heavy mucking was over, all concrete was transported on the floor level, and the cars were lifted to the carriage platforms by elevators and were hauled by hoisting engines up a movable incline.

Water-Proofing.—The water-proofing referred to above was in all cases felt and pitch laid with six thicknesses of felt and seven of pitch. The sub-contractor for the work was the Sicilian Asphalt Paving Co. All joints were lapped at least 1 ft., and where work was suspended for a time and a bevel lap could not be made, the edges of the felt were left unpitched for 1 ft. and the newer work was interlaced with the old. This method was not always successful, however, on account of the softening of the unpitched felt on long-continued exposure to the water. The felt used was mainly Tunaloid, together with some Hydrex. It weighed about 12 lbs. per 100 sq. ft. when saturated and coated on one side only, and contained about 25 per cent. of wool. The coal-tar pitch used had a melting point of 100 deg. Fahr.

After the completion of the tunnel, the concrete arch showed some leakage and in places unsightly lime deposits. It was determined to attempt to stop these leaks by the application of a water-proof cement coating on the intrados of the arch. Extended experimental application of two varieties of materials used for this purpose—Hydrolithic cement and the U. S. Water-Proofing Co.'s compound—have been made with apparent success up to the present time, and the results after the lapse of a considerable period are awaited with interest.

Duct Laying.—The position of the electric conduits, buried in the heart of the concrete walls, interfered greatly with the economical and speedy placing of the lining, and their laying proved to be one of the most troublesome features of the work. The power conduits were single-way, with the bank for high-tension cables separated in the side-walls from the low-tension bank. The conduits for telephone and telegraph service were four-way, and were located in the core-wall. All ducts had ¾-in. walls and a minimum clear opening of 3⅜ in. square, with corners rounded. They were laid with joints broken in all directions, and in about ¼-in. beds of 1: 2½ mortar. Flat steel bond-irons, 2 in. x ⅛ in., with split and bent ends, were placed in the joints at intervals of 3 ft. and projected into the concrete 3 in. on each side, tying together the concrete on opposite sides of the ducts. The joints were wrapped with a 6-in. strip of 10-oz. duck saturated with neat-cement grout, and, in addition, the power conduits were completely covered with a ½-in. coat of mortar to prevent the intrusion of cement and sand from the fluid concrete. The four-way conduits were plastered only over the wraps. Splicing chambers were provided at intervals of 400 ft.

THREE-TRACK TUNNEL LINING.

In the three-track tunnels, a heavy brick arch was used for those portions constructed in tunnel, while, in the open-cut sections, the roof was of concrete. Both were completely water-proofed on the roof and sides, and in the tunnel sections the space above the brick roof was filled with rock packing. On account of the unstable nature of the rock encountered throughout, the voids in the packing were afterward filled with grout.

The haunches of the arch were tied together by steel I-beams anchored in the concrete, with the object of making the structure self-supporting in the event of the removal of the adjacent rock for deep cellar excavations. This construction materialy influenced the contractor's method of placing the masonry lining.

After depositing the floor concrete, by the same method that was used in the twin tunnels, a timber trestle was erected to the height of the underside of the I-beam ties, the posts being footed in holes, about 3 in. deep, left in the concrete floor to prevent slipping. In the open-cut sections the sand-wall forms were of undressed plank tacked to the studding and braced from the trestle; in the tunnel section they were spiked to the face of the posts supporting the timbering.

The side-wall forms were made up in panels about 3 in. x 10 ft., and were clamped to studs by U-shaped irons passing around the stud and bolted to the cleats on the back of the panels, the studs being braced from the trestle. The side-wall concrete was deposited in three sections. The first was brought up just above the sidewalk and formed the bench for the high-tension ducts; the second carried the wall up to the springing line. Before placing the third section the I-beam ties were set in position on top of the trestle, and the reinforcing rods in the haunch of the arch were hung from them. The concrete was carried up to a skewback for the arch and embedded the ends of the ties.

The centers for the arches stood on the I-beam ties, and the top of the hangers, for the permanent support of the ties near their center, were inserted through the lagging. The brick arch, water-proofing, and rock packing were laid up in lifts, in the same manner as in the twin tunnel, with grout pipes built in at intervals of about 8 ft. The concrete arch was placed in sections, from 25 to 50 ft. in length, with a rather wet mixture and a back form on the steep slope of the extrados.

The concrete for the sand-walls and lower part of side-walls was handled on tracks and platforms laid on cantilever beams at mid-height of the trestle. For the walls above the springing line, the tracks were laid on top of the I-beam ties, and some of the arch concrete, also, was delivered from the mixer at that level and hauled up an incline to the level of the top

of the arch. By far the greater part, however, was turned out from mixers set on the completed arch, and was transported on tracks hung in part from the street timbering.

Completion.—Except in the heavily-timbered portions, such as at Fifth avenue, where the load had to be transferred from posts to the completed masonry section by section, the lining of the tunnels presented no special difficulty. The large number of small forms to be set, and the mutual interference of the concreting and duct-laying operations, proved to be the most troublesome features of the work.

The restoration of the streets, public utilities, etc., at the open-cut sections was a slow and tedious operation, but the tunnels themselves were completed in March, 1909, 3 years and 10 months after the inception of the work.

METHOD OF APPLYING AND MAINTAINING TUBES IN LOCOMOTIVE BOILERS—PENNSYLVANIA RAILROAD STANDARDS.

In common with other railways the Pennsylvania has experienced much trouble from leaky tubes, and while on most roads this is attributed to bad water or improper methods of feeding, filling and cooling boilers, on the Pennsylvania, where there is a good water supply and proper methods of handling water are employed, it was found that a large part of the tube leakage was caused by irregular methods of setting and tightening tubes. The practice at different shops and roundhouses was not uniform, and when a passenger

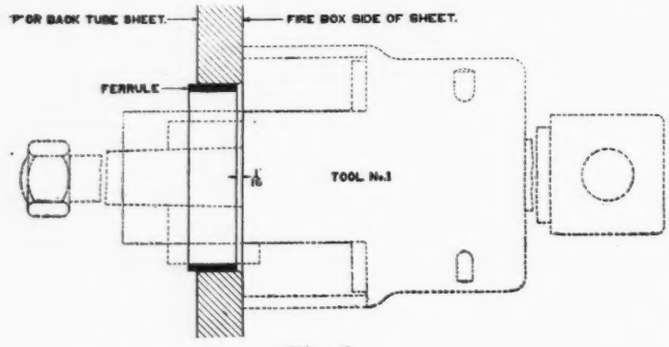


Fig. 1.

locomotive passed over several divisions and required tube repairs, the work was not always done in such a manner as to prevent leakage. In other words, tube repairs were not sufficiently standardized to obtain the desired results. After careful investigation, the best practice for setting tubes at shops and engine houses, the best method of maintaining tubes

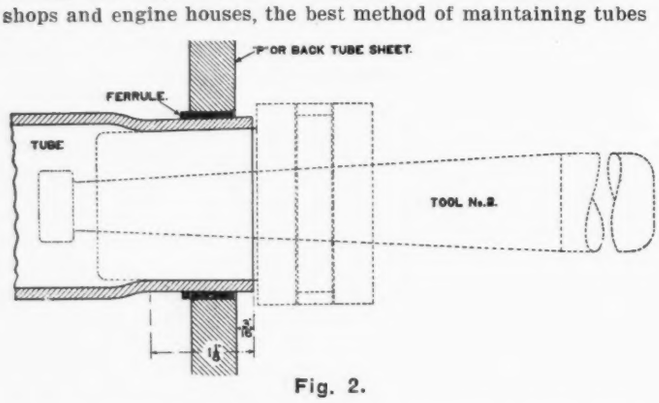


Fig. 2.

at engine houses, the best method of preventing leaky tubes when engines arrive at terminals, and the proper tools for tube work, were all standardized and printed in a circular which was approved in June, 1909, by the lines East and West. Since the adoption of this standard tube practice the number of leaky tubes on the Pennsylvania Lines has been materially reduced. The new circular relating to tubes is as follows:

Tubes must be in accordance with standard specifications and must be ordered .120 in. thick. Material for safe ends must be in accordance with standard specifications and must be ordered .134 in. thick. Ferrules must be made of soft copper and 1/32 in. longer than thickness of tube sheet, and must be ordered .075 in. thick. The outside diameter must be the same as the outside diameter of the tube. Tube holes

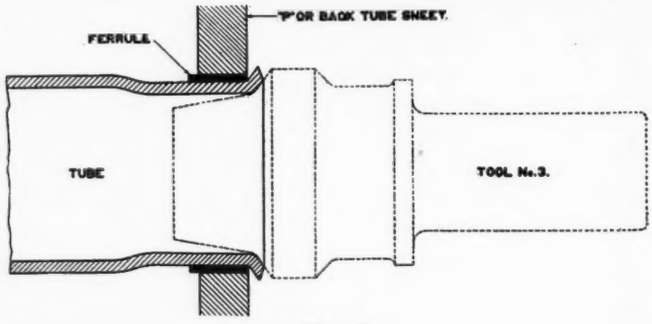


Fig. 3.

in firebox tube sheet must be the same diameter as outside of the tube and a 1/16 in. radius fillet must be provided on each edge of tube holes.

When tube hole in firebox tube sheet becomes ⅛-in. out round it must be reamed. Tube holes in smoke box tube sheets must be $\frac{1}{16}$-in. larger in diameter than the outside diameter of the tube and sharp edges of tube holes removed.

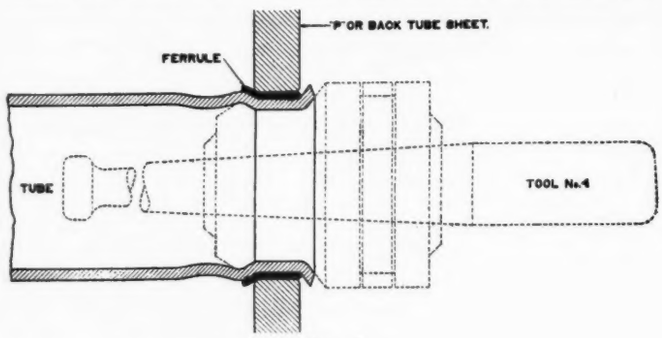
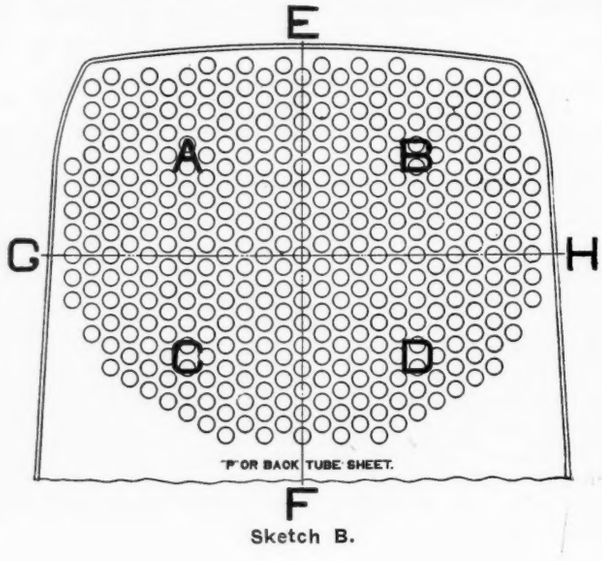


Fig. 4.

Firebox end of tubes must be swaged down with a slight taper towards end of tube to a diameter sufficiently small to allow end of tube to neatly fit ferrule after ferrule has been rolled in tube holes. The swaged end of tube must not be less than 1⅛-in. long, as shown in Fig. 2.

All tools for working tubes in locomotive boilers must be in accordance with standard tracings and the tool numbers



Sketch B.

stamped on each tool with ¼-in. figures. Each tool must be used for the operation specified. All tools No. 5 must be maintained within limits of standard gages and tools No. 4

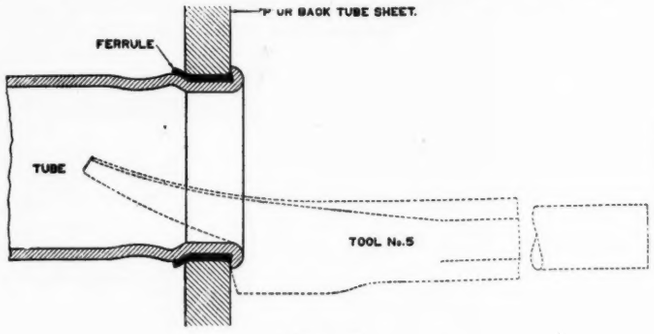


Fig. 5.

must be taken out of service when worn hollow $\frac{1}{32}$-in. between fillets.

APPLICATION OF TUBES IN SHOPS AND ENGINE HOUSES.

Operation No. 1.—Ferrules must be placed in tube holes in firebox sheet, as shown in Fig. 1, and rolled tight with tool No. 1.

Operation No. 2.—Tubes must be placed in tube holes in firebox tube sheet neatly fitted, as shown in Fig. 2, and

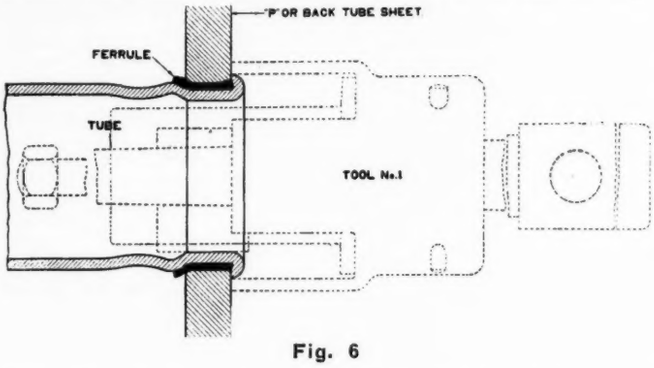


Fig. 6

tightened with tool No. 2. (Operations Nos. 7 and 8, respectively, must be performed after operation No. 2 is completed and prior to commencing operation No. 3.)

Operation No. 3.—Firebox ends of tubes, as shown in Fig. 3, must be opened with tool No. 3, using either a pneumatic or a hand hammer.

Operation No. 4.—Firebox ends of tubes, as shown in Fig. 4, must be expanded with tool No. 4. This operation should

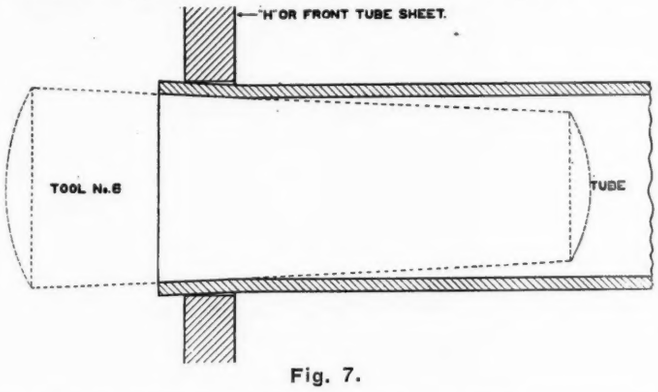


Fig. 7.

be done on tubes along the lines E-F and G-H respectively, as shown in sketch B, and then sections A, B, C and D should be worked out by performing this operation in each section commencing at outer edge of sheet in working the tubes in these sections in circumferential rows toward the center.

Operation No. 5.—Firebox ends of tubes, as shown in Fig. 5, must be beaded with tool No. 5, using either a pneumatic or a hand hammer.

Operation No. 6.—Firebox ends of the tubes, as shown in

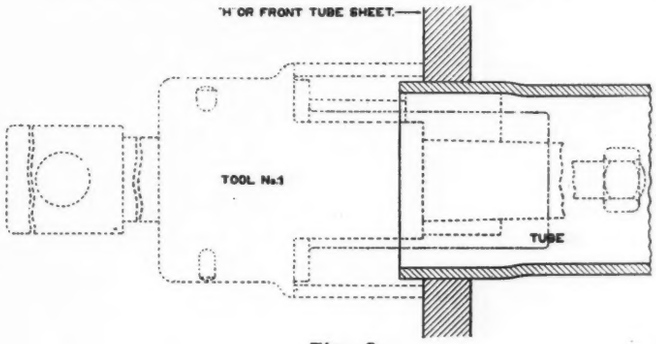


Fig. 8.

Fig. 6, may be slightly rolled with tool No. 1 if necessary.

Operation No. 7.—Smoke box ends of tubes, as shown in Fig. 7, must be tightened with tool No. 6.

Operation No. 8.—Smoke box ends of tubes, as shown in Fig. 8, must be rolled with tool No. 1.

MAINTENANCE OF TUBES AT ENGINE HOUSE.

Tubes which are slightly leaking at the firebox end of locomotive boilers in service must be tightened with tool No. 4 if necessary, after which beads must be reset with tool No. 5. Tubes which are slightly leaking at the smoke box must be tightened with tool No. 1. When a locomotive arrives at an engine house with tubes leaking so badly at firebox end that it must be taken out of service, the boiler must be drained, after which firebox ends of tubes must be reset with tool No. 4 and beads then reset with tool No. 5. When tubes will not stand resetting with tool No. 4, they may be rolled with tool No. 1, after which the beads must be reset with tool No. 5. (Tool No. 1 *must not* be used except in the judgement of the foreman it is necessary.)

PREVENTION OF LEAKING TUBES.

In order to reduce the tube leakage to a minimum the following practice must be followed: When fires are being cleaned or drawn the blower should be used only sufficiently hard to prevent smoke emitting from the fire door. All fires must be banked at tube sheet except in the fire boxes having front grates, bricked off, in which case the fire should be banked over the adjoining grates. Unless absolutely necessary, injectors should not be used while fires are being cleaned, also when no fire is in fireboxes, nor while locomotives are being moved under their own steam in engine yards without first brightening up the fire.

EXPRESS PASSENGER LOCOMOTIVES; PARIS, LYONS AND MEDITERRANEAN RAILWAY.

BY ERNEST GRAHAM.

The Paris, Lyons & Mediterranean Railway may be said to be the home of the compound locomotive. Here the Henri-Baudry system of compounding reigns supreme. The first compound, built by M. Henri, the locomotive engineer of the P. L. M., was introduced in 1889, four years after the introduction of the first de Glehn compound on the Northern Railway of France. Both the Henri and de Glehn types were exhibited at the Paris Exhibition of 1889. One notable difference between these two engines was that M. Henri used coupling rods, whereas M. de Glehn did not. M. Henri also used a high steam pressure, 213 lbs. per sq. in.; that used on the de Glehn engine was 156 lbs. per sq. in. Both engines had the h.p. cylinders placed inside the frame and coupled to the leading driving axle, the low pressure being outside and coupled to the rear driving axle. In the de Glehn engine the l.p. cylinders were set back on the frames, but in the Henri en-

gine all four cylinders were abreast, long piston and connecting rods being used in connection with them.

The Henri system was applied to several distinct types of engines, and proved very successful. The disposition of the cylinders was not always the same as in the above-mentioned engine. The system was continued with modifications by M. Baudry, successor to M. Henri. In 1892 the first of 50 eight-wheel-coupled four-cylinder compound goods engines was introduced, all cylinders driving the second axle. The same year a new type of four-cylinder compound 4-4-0 express engine appeared, with l.p. cylinders inside the frame driving the leading coupled wheels, and h.p. cylinders outside the frame set back to drive the trailing coupled wheels in the same way as in the de Glehn system.

Forty more 4-4-0 engines of the same type were built in 1894, and various types compounded on the same system were introduced in the succeeding years. It is hard to draw a dividing line between the Henri-Baudry and de Glehn systems; the difference is chiefly one of intercepting valves and other details. Up to 1904 the bulk of the express work was done by the four-cylinder compound 4-4-0 engines known as class C. There were 120 of these engines numbered 61 to 180, and even now they are doing very fine work. The goods traffic during the same period was worked largely by a 4-6-0 class of four-cylinder compound, numbered 3,401 to 3,650. Since 1904 the locomotive stock of the P. L. M. has been largely augmented by more compounds of the Henri-Baudry type. I append a tabulated list of the principal dimensions of these later types.

The first to appear were the large 4-6-0 class, series 2,600 (Fig. 1). In this class the h.p. cylinders placed outside the frame drive the second pair of coupled wheels, the l.p. cylinders being inside the frame and driving the leading coupled wheels, all being placed nearly in line, the outside cylinders having much longer piston and connecting rods. Independent motion of the Walschaerts type is provided for both inside and outside cylinders, and provision is made for the independent adjustment of the h.p. valve gear, but I understand that, as a rule, this is not used, the reversing shafts of both sets of motion being actuated at the same time, and not separately at the will of the driver. The maximum admission of steam to the cylinders is 88 per cent. of the stroke in the h.p. and 63 per cent. in the l.p. Live steam is admitted to the l.p. cylinders for starting. Of this class 137 engines were in service on Oct. 1, the last 10, built in 1908, being fitted with

PRINCIPAL DIMENSIONS OF P. M. L. RY. LOCOMOTIVES.

		4-6-0 Compound Express Locomotive. Series 2600		4-8-0	Pacific Type	
		Without superheater.	With superheater.	Comp. Goods locomotive.	Comp. Exp. locomotive.	Simple Exp. locomotive.
Cylinders	Diameter, HP	13.386 in.	14.567 in.	14.96 in.	15.354 in.	4 cyl. 18.898 in.
	" LP	21.26 "	21.26 "	23.622 "	24.41 "	....
	Stroke of piston	25.59 "	25.59 "	25.59 "	25.59 "	25.59 in.
	Ratio of volume, HP to LP	2.52	2.13	2.49	2.55	....
Wheels	Diameter of bogie	3 ft. 3⅜ in.		3 ft. 3⅜ in.	3 ft. 3⅜ in.	3 ft. 3⅜ in.
	" " coupled	6 " 6¾ "		4 " 11 "	6 " 6¾ "	6 " 6¾ "
	" " trailing	.....		....	4 " 5½ "	4 " 5½ "
Boiler	Center of boiler from rail level	8 " 6⅜ "		8 " 6⅜ "	9 " 6⅛ "	9 " 6⅛ "
	Length of barrel	12 " 9½ "		13 " 6½ "	19 " 4¼ "	19 " 4¼ "
	Diameter of barrel (outside)	5 " 0⅜ "		5 " 2⅜ "	5 " 7½ "	5 " 7½ "
	Steam pressure	227 lbs.		227 lbs.	227 lbs.	170 lbs.
	Grate area	32 sq. ft.		33.2 sq. ft.	45.7 sq. ft.	45.7 sq. ft.
	Number of tubes	138 serve	64 serve 21 plain large 19 plain small	146 serve	278 plain	143 pln. sm'll 28 " large
	Diameter of tubes (exterior)	2.756 in.	64—2.756 in. 21—5.0 " 19—1.969 "	2.756 in.	2.323 in.	143—2.323 in. 28—5.236 "
	Tubes—Material	Steel	Steel	Steel	Steel	Steel
	Total heating surface of boiler	2,380 sq. ft.	1,546 sq. ft. without superheater	2,660 sq. ft.	3,046 sq. ft.	2,348 sq. ft.†
Weights, in working order	On bogie ..... lbs.	46,046	47,645	35,750	44,419	50,198
	" coupled wheels ..... "	112,468	112,987	126,560	122,326	122,326
	" trailing wheels ..... "	....	....	....	34,989	33,354
	Total ..... "	158,514	160,632	162,310	201,734	205,878
Tender	Capacity of tank ... gallons	4,842		3,543	6,162	6,162
	Coal carried ..... tons	3.6		4.5	4.5	4.5
	Total weight in working order ..... lbs.	99,613		86,060	135,744	135,744
Engine and tender	Total weight in working order (tender empty) ..... lbs.	258,127	260,245	248,370	337,478	341,602
	First of class commenced running	1905	1908	1908	1909	1909
	Number of class in service Oct. 1, 1909	127	10	185	1	1
	Type of superheater used	....	Schmidt	....	....	Schmidt
	Makers	Various	Henschel & Sons.	Various	P.L.M. Ry. Co.	P.L.M. Ry. Co.
Tractive effort ..... lbs.		16,971	18,789	28,740	22,407	33,539
Weight on drivers / Total weight		70.95*	70.32*	77.97*	60.40*	59.41*
Weigat on drivers / Tractive effort		6.62	6.01	4.40	5.46	3.64
Total weight / Tractive effort		9.34	8.55	5.62	9.04	6.13
Tractive effort × diam. of drivers / Heating surface		560.82	132.23	691.11	549.01	1,123.40
Heating surface / Heating surface		74.37	48.31	80.12	66.65	51.37
Grate area / Weight on drivers		47.25	73.08	47.58	40.16	52.09
Heating surface / Total weight		66.60	103.90	60.64	66.49	87.68
Heating surface / Displacement 2-h.p. cylinders ..... cu. ft.		4.16	5.94	5.2	5.48	8.30
Displacement 2-h.p. cylinders / Heating surface		572.16	312.95	511.53	555.84	.....
Displacement 4 cylinders / Grate area		.....	.....	.....	....	.141.44
Displacement 2-h.p. cylinders / Grate area		7.69	5.38	6.38	8.33	.....
Displacement 4 cylinders		.....	.....	.....	.....	5.51

*Per cent. †Plus 649 sq. ft. superheater.

Schmidt superheaters. These 10 engines have h.p. cylinders increased from 13.38 in. diam. to 14.56 in. diam., the l.p. remaining the same as on the previous 127 engines of this class. This reduces the ratio of cylinder volumes h.p. to l.p. from 1:2.52 to 1.:2.13, and comparative results should be interesting.

In 1908 a type of 4-8-0 four-cylinder compound goods locomotive (Fig. 2) was introduced. This engine has a larger boiler than the 2,600 class (for full particulars see tabulated list). I understand these engines have been remarkably successful, and 185 of this class were in service on October 1.

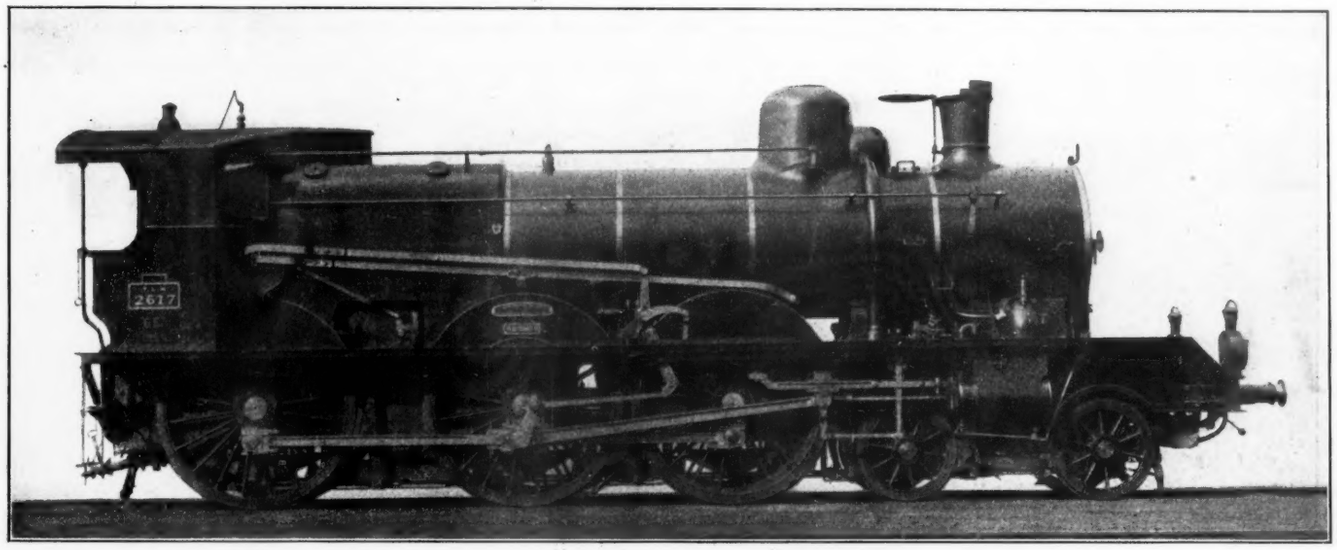


Fig. 1—Ten-Wheel Four-Cylinder Compound.

Some very fine 4-6-4 tank engines having the same boiler as the 2,600 class, and weighing 86 tons, were also introduced about this time. The dimensions of this class I have not to hand. Some Atlantic type engines having similar dimensions to the 4-6-0 class series 2,600 were also built. The year 1909 has seen the introduction of two remarkable locomotives on the P. L. M. Both have been built to the designs of the present locomotive engineer of the P. L. M. at the company's works in Paris. They are of the 4-6-2 or Pacific type, one (Fig. 3) being a four-cylinder compound, having cylinders h.p. (2) 15.35 in. diam., l.p. (2) 24.41 in. diam., with a stroke of 25.59 in., giving a ratio of cylinder volumes h.p. to l.p. of 1.:2.55. The other (Fig. 4) is a four-cylinder simple engine fitted with a Schmidt superheater, the cylinders being 18.898 in. diam. by 25.59 in. stroke. These engines have very large tenders, carrying 6,100 gallons of water, this being made a necessity by the absence of water pick-up troughs. At present a trial is being run between these two interesting locomotives. I understand that whichever of the two gives greatest satisfaction will be adopted for the heavy express work on the P. L. M. system. In view of the controversy which has long raged round the subject of simple versus compound, the result will be awaited with interest by all locomotive engineers. I think it will be generally agreed that the battle in the future will be between the four-cylinder compound and the four-cylinder simple fitted with a superheater. Although in England at the present time the two-cylinder engine still holds almost unrivalled sway there are signs that the better balancing and distribution of stresses obtained by the four-cylinder arrangement will eventually triumph. These advantages should make themselves felt in the repair bill. As compounding does not seem to make much headway in England, it looks as though superheating would have an easy victory. The apparently conflicting conclusions arrived at by locomotive engineers in England are very difficult to understand. To-day, after 30 years, the compound locomotive holds an assured position on many large continental railways; whereas in England it is looked on with disfavor and dis-

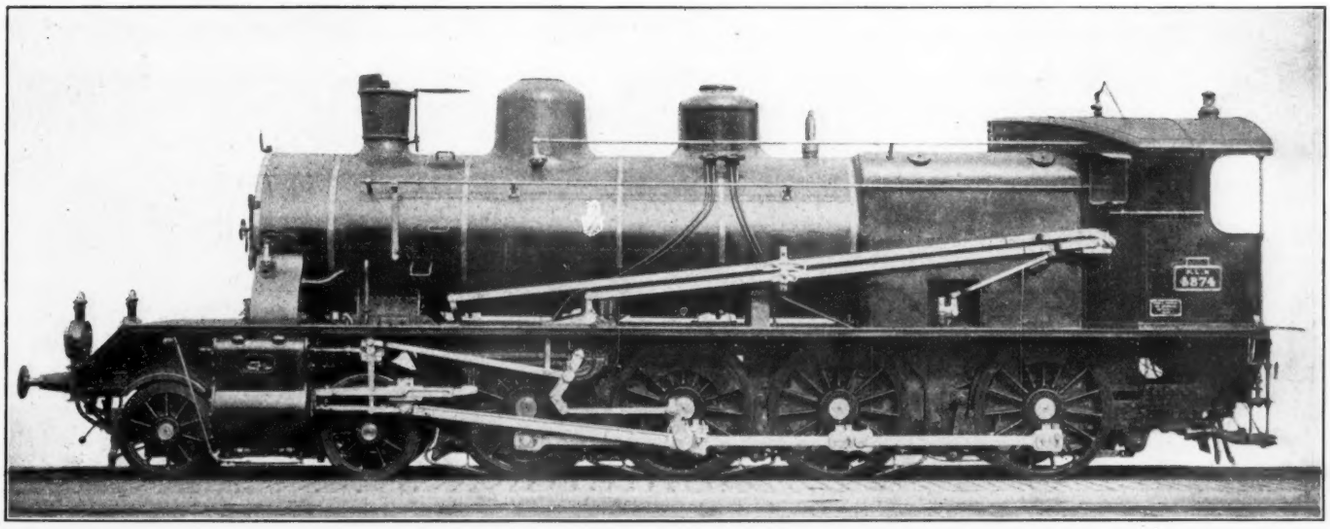


Fig. 2—Twelve-Wheel Four-Cylinder Compound.

trust in most quarters. The conditions of work may be different but that can hardly account for the difference of opinion, as in some systems of compounding, notably that introduced by the late W. M. Smith, of the North Eastern Railway, the main object was to produce an engine which could be adapted, in a very considerable degree, to the work required of it, and not so much to obtain direct economy by compounding. One writer, in a contemporary, makes the assertion that "at present there is not on British rails a compound with cylinder volumes really appropriate for the steam pressures may lie, not so much in the design of the English compound, as in the management of the machine after it leaves the works. Perhaps English locomotive superintendents are not encouraged to experiment or depart radically from standard methods, and, rightly or wrongly, individual originality of persons not occupying principal positions has very little opportunity.

Superheating is slowly but surely coming to the front in England, but to Germany, Belgium and America must be given the entire credit for all pioneer work in connection with what they have proved, beyond doubt, to be a source of much

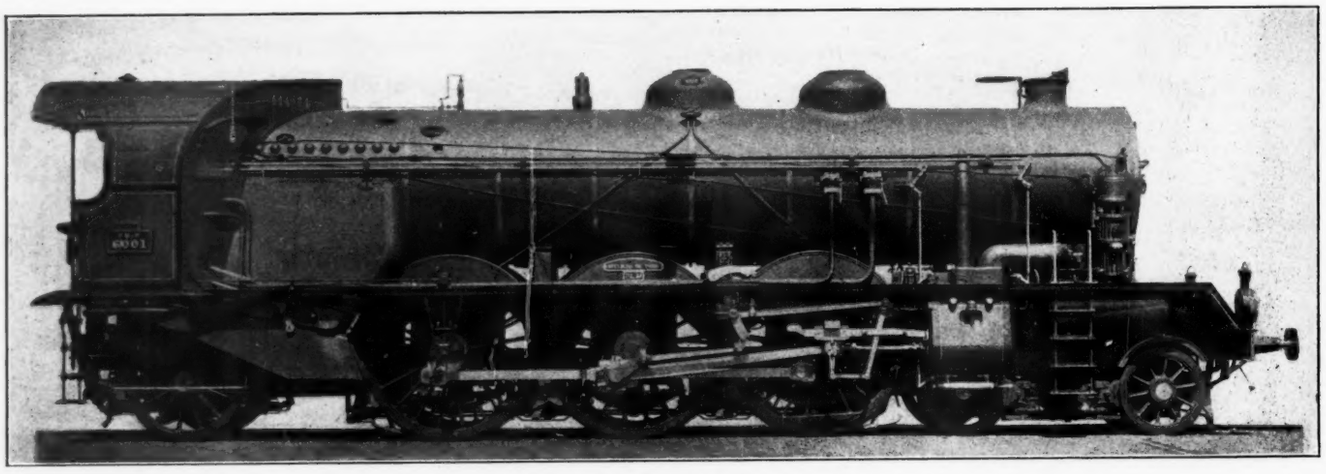


Fig. 3—Pacific Four-Cylinder Compound.

used or designed in a manner to successfully utilize two-stage expansion with all its advantages."

Yet if we compare the cylinder volumes of the P. L. M. compounds (and no one can say they are not successful) with the later English compounds we find practically no difference. The new compound Pacific on the P. L. M. has a ratio of 1:2.55, the 4-8-0 class on the same railway have a ratio of 1:2.49. The latest compound on the Great Northern of England, No. 1,421, has a ratio of 1:2.49; No. 1,306, a de Glehn

economy in coal. The main advantage of both superheating and compounding is reduction of cylinder condensation. It is not likely that the two will be employed in conjunction to any large extent. It is claimed that an economy of 15 per cent. can be gained by superheating when applied to a compound; but compounding needs a very high steam pressure, whereas with superheating on a simple engine the boiler pressure can be reduced very considerably, thereby reducing the upkeep of the most expensive part of the engine. I contend,

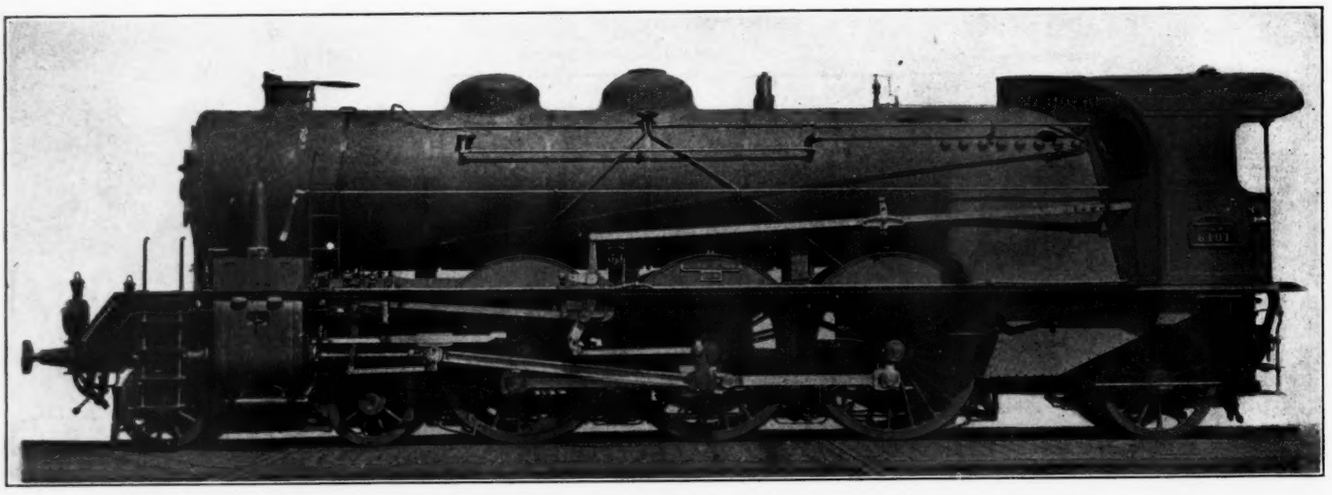


Fig. 4—Pacific Four-Cylinder Simple Locomotive.

compound on the G. N. Ry., has a ratio of 1:2.69; No. 730, on the North Eastern Ry., has a ratio of 1:2.38. "La France," a French built compound on the Great Western Ry., has a ratio of 1:2.72. No. 103, another Great Western French built compound, has a ratio of 1:2.77, and yet the respective locomotive engineers on the various English railways mentioned have all decided against compounding, presumably because of the extra first cost involved. The writer cannot accept the suggestion put forward in some quarters that French-built simple engines are inferior to English engines of the same type. The fault

therefore, that the issue is one of compounding versus superheating. It is with the intention of solving this problem that the P. L. M. Co. has built what I consider to be two of the finest locomotives in the world.

All these later P. L. M. engines are fitted with automatic speed indicators, generally of the Flaman type. Detroit sight feed lubricators are used for the cylinders and piston valves except on those fitted with superheaters, which have Friedmann pumps.

Figure 5 is a profile of the main line of the P. L. M. from

Paris to Dijon, drawn to a scale of English measurements for purposes of comparison with grades on English and American railways. The diagram gives only the average grade between any two stations. The most interesting section of the line from Paris to Marseilles is that from Laroche to Dijon. Blaisy Bas summit is over 1,000 ft. higher than Laroche, and although the grades, with the exception of the last 20 miles, are fairly easy, they are long and continuous. Between Marseilles and Nice heavy grades are also encountered. The speed is generally limited to 100 kilometers (62.1 miles) per hour, although higher speeds are sometimes allowed.

The P. L. M. not only has the largest mileage of any railway in France, but also the fastest long-distance train. This train, the celebrated "Coté d'Azur Rapid," the day train between Paris and the Riviera, both up and down in the winter season, was introduced in 1904, and was the first train to leave Paris in the morning and reach the Riviera the same

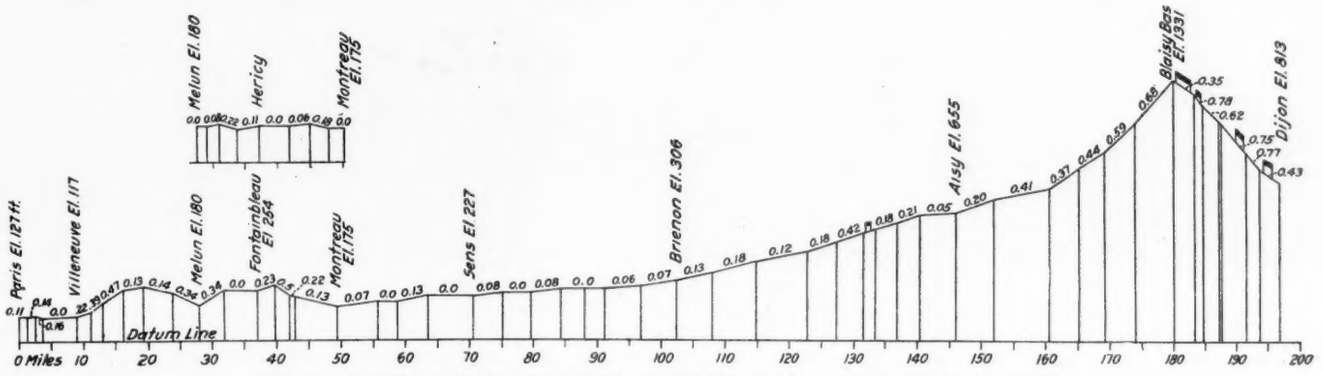


Fig. 5—Profile of Line from Paris to Dijon; Paris, Lyons & Mediterranean.

evening. It is a train de luxe, but also conveys ordinary first-class passengers. The load of this train is usually from 230 to 280 tons, and its schedule in both directions is given below.

TABLE B—*"Coté d'Azur" Schedule—Outward Journey.*

Place.	Time—Arrive.	Time—Depart.	Miles.	Speed in m.p.h.
Paris	.....	9:00 a. m.	..	....
Laroche	10:49 a. m.	10:54 a. m.	97	53.2
Dijon	12:52 p. m.	12:58 p. m.	100	50.8
Macon	2:21 p. m.	2:24 p. m.	78	55.7
Lyons	3:13 p. m.	3:19 p. m.	45	55.1
Valence	4:29 p. m.	4:32 p. m.	66	56.5
Avignon	5:55 p. m.	6:01 p. m.	78½	56.7
Marseilles	7:27 p. m.	7:33 p. m.	75	52.9
Toulon	8:30 p.m.	8:35 p. m.	41½	44.4
St. Raphael	9:51 p. m.	9:52 p. m.	59½	46.9
Cannes	10:25 p. m.	10:31 p. m.	20	36.3
Nice	10:58 p. m.	.....	19	42.2

Total time including stops, 13 hours 58 minutes. Average speed for the 540 miles to Marseilles, 51.3 m.p.h.

TABLE C.—*"Coté d'Azur" Schedule—Homeward Journey.*

Place.	Time—Arrive.	Time—Depart.	Miles.	Speed in m.p.h.
Nice	.....	8:05 a. m.	..	....
Cannes	8:30 a. m.	8:35 a. m.	19	....
St. Raphael	.....	9:06 a. m.	20	....
Toulon	10:23 a. m.	10:28 a. m.	59½	....
Marseilles	11:37 a. m.	11:42 a. m.	41½	....
Avignon	1:08 p. m.	1:14 p. m.	75	52.3
Valence	2:43 p. m.	2:46 p. m.	78½	52.9
Lyons	4:02 p. m.	4:07 p. m.	66	52
Macon	4:57 p. m.	5:00 p. m.	45	54
Dijon	6:28 p. m.	6:34 p. m.	78	53.1
Laroche	8:24 p. m.	8:29 p. m.	100	54.5
Paris	10:15 p. m.	.....	97	54.9

Total time, Nice to Paris, including stops, 14 hours 10 minutes. Average speed for 540 miles, Marseilles to Paris, 53.5 m.p.h.

It covers the 540 miles from Paris to Marseilles at an average speed of 51.3 miles per hour, and on the return journey from Marseilles to Paris its average speed is 53.5 m.p.h., a performance which is perhaps unequalled in the world.*

*The 18-hour trains from New York to Chicago, over the New York Central and the L. S. & M. S., run 964 miles at an average speed of 53.5 miles per hour.—EDITOR.

A concession has been granted by the municipal authorities of Bergen, Norway, for an electric cable railway for passenger traffic, from Bergen to a point on the mountainside overlooking the harbor.

LAKE SHORE METHOD OF CASTING DRIVING BEARINGS IN THE BOX.

At the recent meeting of the International Railway Foremen's Association, A. O. Berry, superintendent of the Elkhart, Ind., shops, gave a description of their method of pouring the brass bearing of driving boxes into the steel boxes, thus saving the necessity of slotting the boxes and turning the bearings. This method is as follows:

After the old shell is pressed out, the box is sent to the slotter, where five dove-tailed grooves are cut in the old shell bearing, as shown on Fig. 1. If the box is too thin on top, the upper groove may be done away with, and only four grooves applied, bringing the two middle ones a little closer to the top.

Likewise, if it is found that the two extreme lower grooves will cut through into the shoe or wedge face, they can be brought upward or not made as deep as the other grooves. These grooves are 1¼ in. to 2 in. in length, and ¼-in. to ⅜-in. deep.

The box is then taken to the boring mill and a groove cut in the hub face about ½-in. deep and ½-in. wide at the edge of the old crown bearing as shown in Fig. 2. This groove is

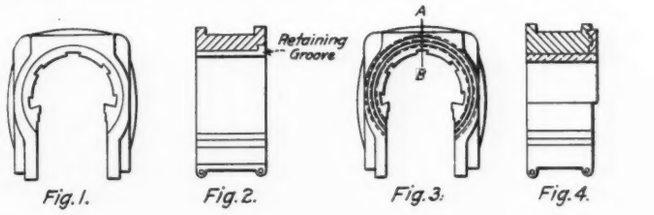


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

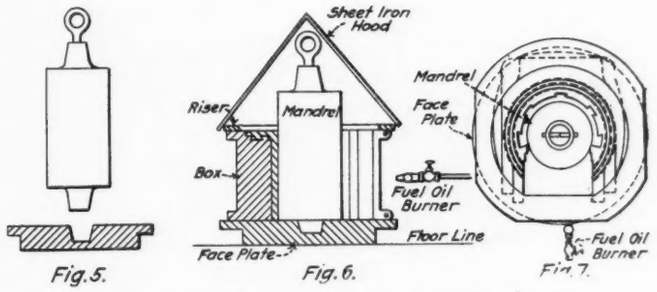


Fig. 5. Fig. 6. Fig. 7.

Method of Casting Driving Bearings in the Box.

shown, also, in Fig. 1, and may be called a "retaining groove," inasmuch as it will retain the shell in the box, even if it becomes slightly loose.

If the design of the box calls for a hub-liner on the box, and the hub-face on the box is not already grooved for retaining some soft metal, then the box is left on the boring mill until dove-tailed grooves are cut in the hub-face for retaining the brass hub liner.

Fig. 4 shows a cross-section through A-B of Fig. 3, with

the brass already poured, and the hub-liner and crown brass in one solid piece. After the machine operations are completed on the box, it is taken to the brass foundry, where the operations are as follows: The box is set on a face plate with the inside face down, and the hub face up, and a cast iron riser is placed over the top of the box, care being taken that all places for brass to run out are stopped with fire-clay, and a sheet iron hood placed over the box for retaining the heat thrown out by the oil-burner. A fuel oil torch is then applied between the lower ends of the box; that is, in the cellar space, and the box is heated in this manner until it is dark red. The burner is then taken away, the hood removed and the proper size mandril dropped in place. The exact position of the box on the face plate is originally determined with the mandril in place, the mandril being then removed during the process of heating. After the box is sufficiently heated, and the mandril dropped in place, the space between it and the box is lined up with long sheet iron strips dropped in place. Oil holes or other holes in the top of the box are stopped up by means of fire-clay.

Fig. 6 shows the box after it is heated, and with riser and mandril in place. It also shows the hood in place. The hood, however, must be removed during the process of pouring, and is simply shown in this sketch to give an idea of its appearance. Fig. 7 is a plain view of the box, with mandril and riser in place ready to be poured. The mandrils used are always of a smaller diameter than the driving journal, and all boxes are bored after leaving the brass foundry.

NEW FEATHERSTONE FOUNDRY, CHICAGO.

The new Featherstone foundry was built especially for the production of miscellaneous locomotive and car castings and it will be of considerable interest to mechanical officers of railways, as it embodies the latest ideas in foundry construction and operation. The principal customers of the Featherstone Foundry Company are the Illinois Central, the Chicago, Rock Island and Pacific, and other western roads and the Pullman Company. The location at Ninety-fifth street and Cottage Grove avenue, Chicago, is a convenient one for delivering to the shops of these companies. It is directly east of the Burnside shops of the Illinois Central, at a junction of that line with the Rock Island, and the Pullman shops are but a short distance south. The Arnold Company designed the plant and supervised the engineering features of construction. The general contract was secured by R. & S. Sollett Company, and the material for the steel structure was sublet to the Kenwood Bridge Company.

The foundry was placed in operation about July 1, 1909, and has already worked up to an output of 75 tons per day. The

Pattern Storehouse.

molding floor space is 3,200 sq. ft., and the production of castings is at the rate of 2 tons per sq. ft. The ordinary rate at most foundries is ¾ to 1½ tons per sq. ft. of floor. The plant consists of two principal structures, the foundry building and the pattern storage building. The yard is ample for the storage of material, the storage bins, sand house, etc., all of which can be served by the yard crane, which runs practically the entire length of both buildings.

THE FOUNDRY BUILDING.

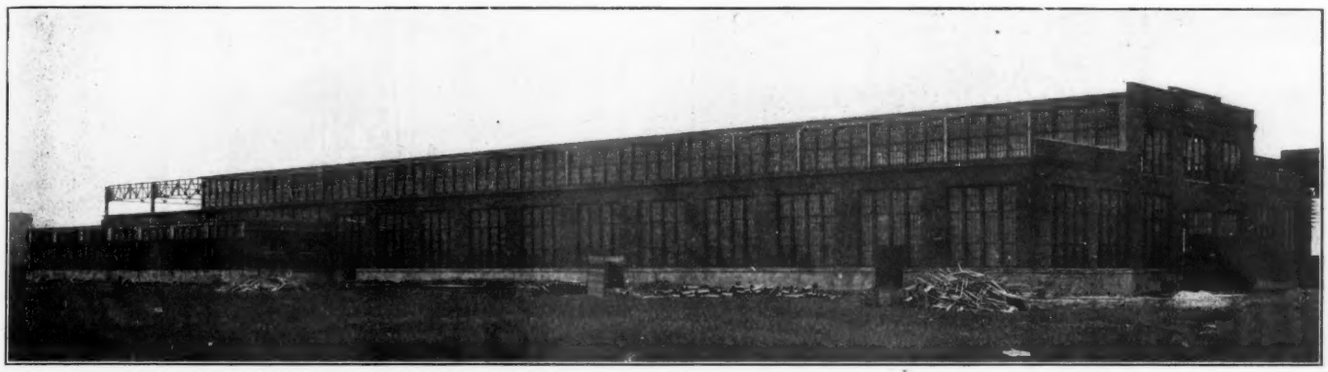
The foundry building is 361 ft. long by 130 ft. wide inside, with side bays for shipping room, charging platform and ovens. Steel columns support the crane runways and roof trusses of the central bay, while the outer ends of the side bay roof trusses rest on the brick walls. All the outer walls

Featherstone Foundry; Interior.

are brick, with the exception of the south end of the foundry, which is made of cement plaster on expanded metal so that it can be readily removed when any extension to the building is desired. The foundations are concrete, extending down to firm blue clay, and the wall footings are carried up with concrete to an elevation of 4 ft. above the clay floor. The roof construction is somewhat novel. Hyrib, an expanded metal manufactured by the Trussed Concrete Steel Company, was laid directly on and fastened to the steel purlins, which are spaced about 5 ft. span. On top of this expanded metal was spread 1¾ in. of concrete. Then the under side of the metal was plastered with cement, making the total thickness of the roof 2 in. Upon this was spread the regular 4-ply composition roofing. The central bay of the foundry is 59 ft. wide and 31 ft. 6 in. high to the bottom of the roof truss. A standard gage track runs the entire length of the building, and industrial tracks are conveniently located for handling ladles, castings and other materials. A 15-ton electric traveling crane serves not only this entire bay, but the runways are extended out 80 ft. beyond the end wall so that this crane can run over the cleaning room and outside for heavy cleaning and to serve cars. A passage is made in the end wall by means of five steel roller doors of the Kinnear type, which are operated by a 5 h. p. electric motor.

Special consideration was given to light and ventilation. The clear story windows are large size and alternate sash are hung on specially constructed Allith hangers and made to slide back of the intermediate sash. These intermediate sash are attached to an endless cable with chain inserts passing over the sprocket wheel and returning to a 4 in. compressed air cylinder. The windows are operated in four groups, each group provided with this device so that they can be opened or closed by means of a 3-way cock in an air pipe attached to a column on the main floor.

The east bay is 35 ft. 6 in. wide and 19 ft. high, and is served by two hand-operated 2-ton traveling cranes with electric hoist for use in molding and pouring. The west bay is similar in dimensions to the east bay, excepting that that portion by the cupola and storage room is served by one 2-ton nand crane with electric hoist. The storage rooms extend 18 ft. outside the main building line and are each 29 ft. 5 in. x 25 ft. 5 in. x 10 ft. 6 in. high. Between these two storage rooms is an 8-ft. passage way leading from the elevator to the outside yard. At present only one cupola is installed, but provision is made for a second one. The one installed is a No. 9 standard Whiting, capable of melting 14 to 18 tons per hour. Immediately south of the storage room and cupola is the dry oven, 16 ft. x 35 ft. 9 in. and 11 ft. high inside. The core ovens, three in number, are 20 ft. long and of different widths, each provided with a steel roller door and trucks. Above the storage room is the mezzanine floor of reinforced concrete construction. Here are installed a No. 6½ blower supplying blast to the cupola and an air compressor with 8 in. x 12 in. cylinders, supplying air for the air lifts and for handling the upper deck sash. On this floor is also provided ample room for lavatories and lockers. Above the mezzanine floor



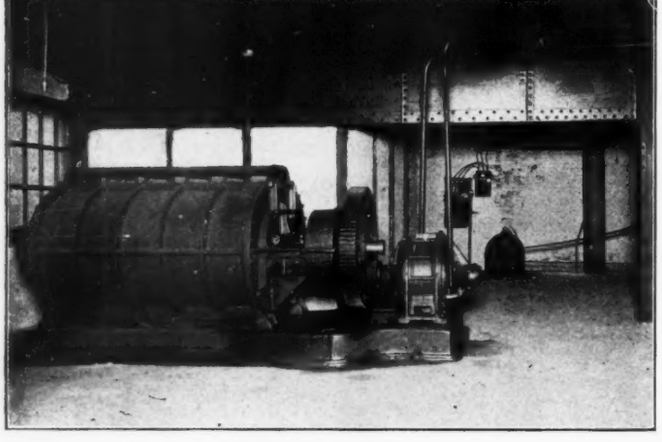
General Elevation; Featherstone Foundry.

Material Yard and Crane; Featherstone Foundry.

is a charging floor. The portion of this floor inside the line of the main building wall is made of ½-in. steel plate on steel framing designed to carry a load of 500 lbs. per sq. ft., and it is surrounded by a steel curb 4 ft. high. The platform extending outside the main building is ⅝ in. plate, capable of carrying 800 lbs. per sq. ft. and has a steel plate curb 18 in. high. The outside platform may be shut off from the inside charging room by roller doors hung between the columns

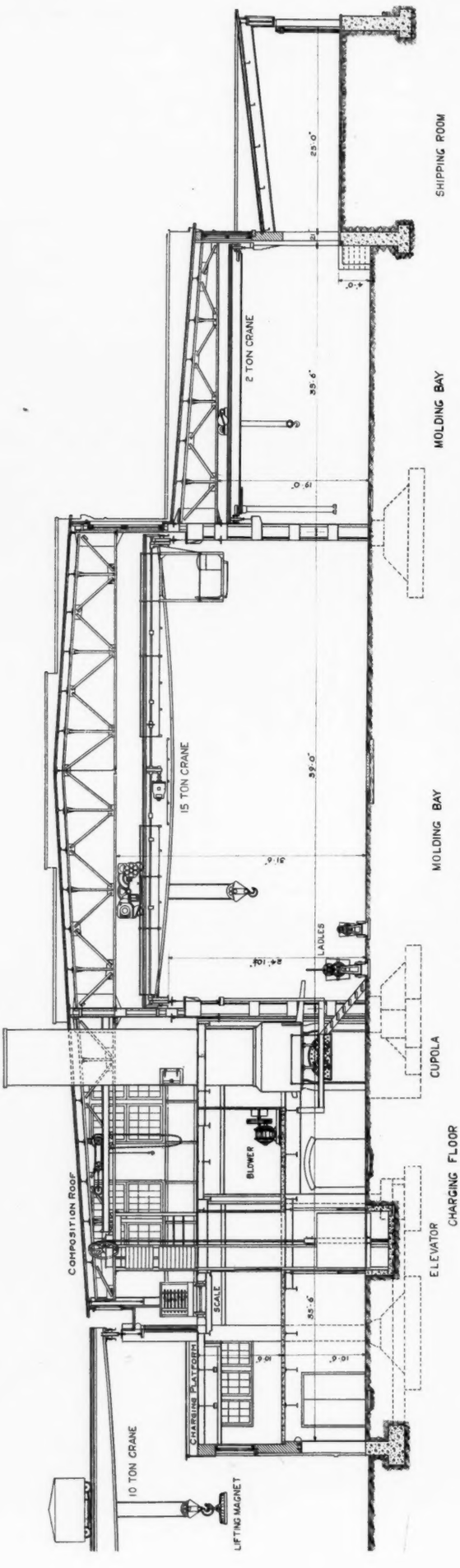
Cupola Charging Platform.

along the wall line. The floor plates are all riveted to the floor beams and are made water tight. Just inside the door, and extending the width of the charging floor, is a transfer pit made of steel plates and a truck running in this pit has a turntable and multiple beam foundry scale. The inside charging floor is also served by a 6,000-lb. electric freight elevator and a hand-operated air hoist traveling crane is pro-



Blower Room.

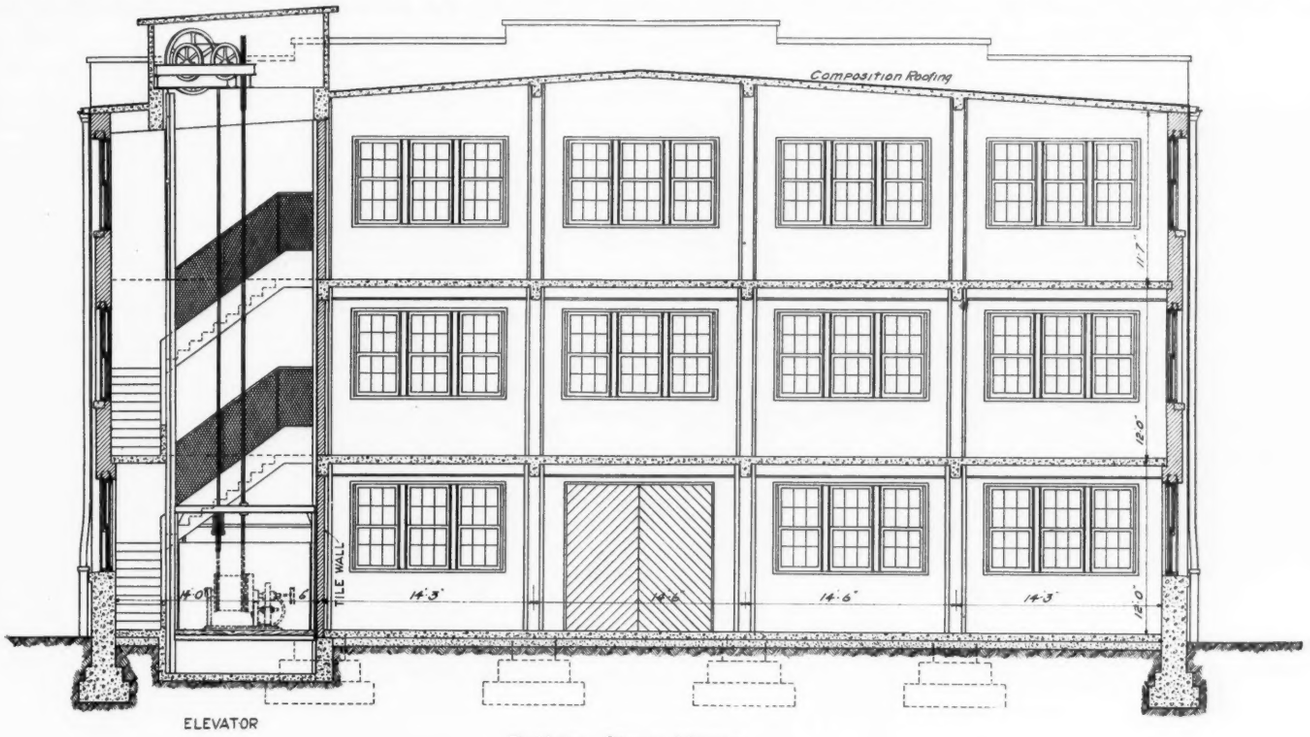
vided for handling coke. The outside charging platform is served by a 10-ton yard crane. This arrangement of weigh scales and transfer table is intended to save repeated handling. The lifting magnet on the yard crane will take scrap or pig iron from the cars on which it is shipped, raise it to the charging platform and deliver to the small cars. These cars then pass on to the transfer scale and are weighed and delivered to the cupola side ready for direct discharge into it. In the



Cross Section; Featherstone Foundry.

same way the coke is loaded into a square sheet iron bucket with drop bottom. This is delivered to charging platform and set down on a frame with casters and it can be moved over the transfer, weighed and then on to the cupola, where it is dumped direct. This direct method of handling iron and coke to the cupola saves a large amount of labor, which is usually employed by the ordinary indirect method.

The cleaning room is 60 ft. wide and extends across the south end of the building 130 ft. The partition wall between this room and the main bay is of cement plaster on expanded metal, extending in the side bays to the roof and in the center bay only 16 ft. 6 in. high to allow passage overhead for the traveling crane. Industrial tracks lead from the molding room into the cleaning room alongside the tumblers and thence to the air lifts leading to the platform.

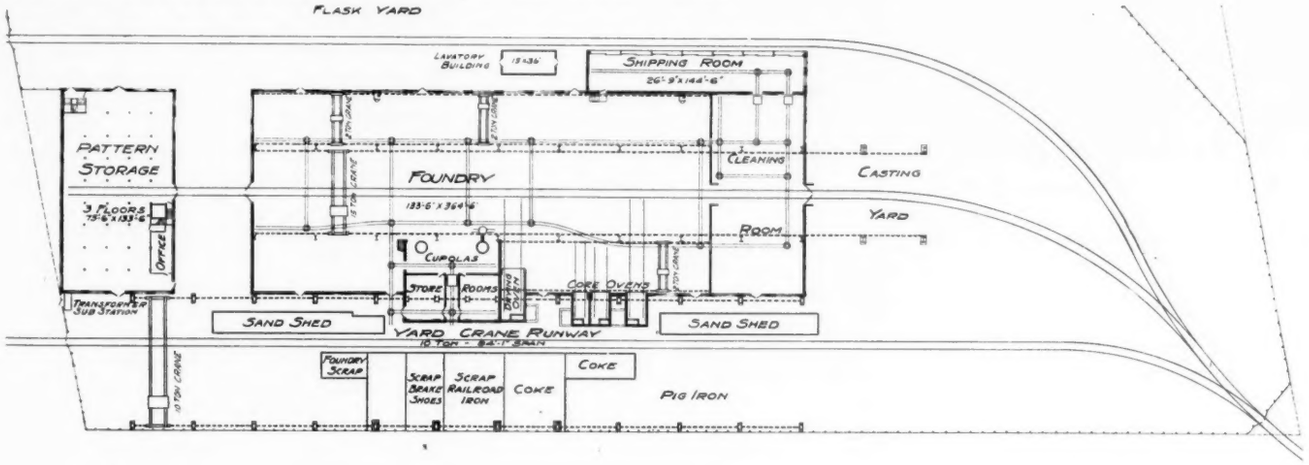


Pattern Store House.

THE PATTERN STORAGE BUILDING.

The pattern storage building is a 3-story structure with reinforced concrete floors, columns and roof and with brick exterior walls. The inside dimensions are 130 ft. x 72 ft. A 3,000-lb. electric elevator serves the three floors. The elevator shaft, together with the concrete stairway, is partitioned off from the main building by plastered tile partitions. The pattern shop is located at the east end of the first floor and is supplied with planer, band saws and other necessary pattern makers' tools. These are driven by a 15 h. p. motor connected to a line shaft.

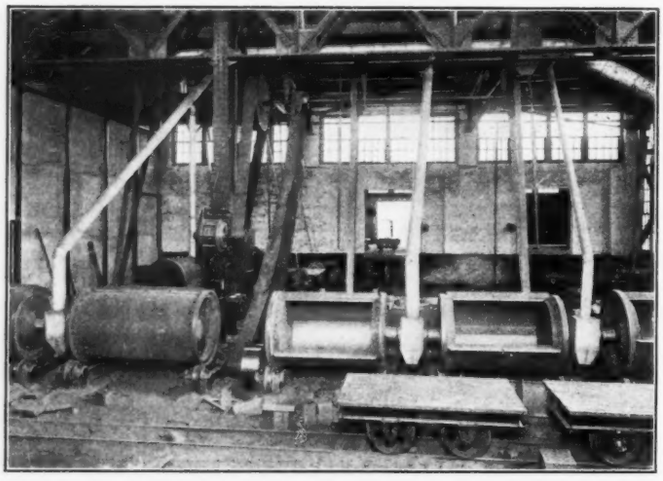
The yard crane is 84 ft. 1 in. center to center of rails and extends along the west side of both the pattern storage building and the foundry, a length of 440 ft. The crane is equipped with a 10-ton electric trolley, fitted with a lifting magnet having an ultimate lifting capacity of 3,000 lbs. The 15-ton traveling cranes in the foundry and the 10-ton yard crane are Shaw cranes, and the smaller hand cranes were made by the Maris Company, Philadelphia. All these cranes were furnished by Manning, Maxwell & Moore. The standard gage track is located between the buildings and the bins, where cars are easily served by the yard crane. The lifting magnet is operated by a 10-kw. 220-volt direct current generator connected to a 15 h. p. 3-phase 60-cycle 220-volt constant speed motor. This equipment is all on the bridge of the yard crane.



Ground Plan; Featherstone Foundry.

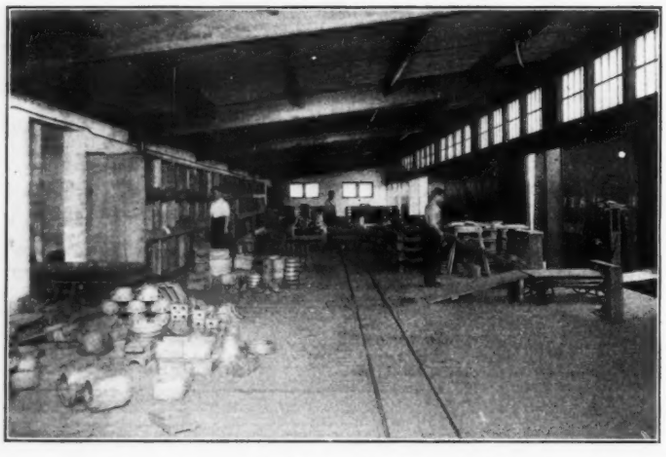
ELECTRICAL EQUIPMENT.

The motive power of the entire plant aggregates 475 h. p., and electric current is purchased from the Commonwealth Edison Company. Through six oil transformers the current is stepped down from 2,200 volts to 230 volts 3-phase. The entire electric system is laid out with provision for future extension and with special attention to safety devices so as to withstand the inattention or actual abuse which is almost sure to occur at times in a plant of this nature. All motors are 3-phase of the squirrel cage rotor type provided with 3-pole single throw oil circuit breakers with no voltage release, Westinghouse type H.



Cleaning Room.

The lighting system of the plant is a 3-wire single phase alternating current system. A main panel is installed at the foundry building from which three main wires lead to the various distributing panels in the two buildings. The wiring is all done in conduit incorporated in the concrete floors and roof. The pattern shop is lighted entirely by incandescent lamps suspended from the ceiling by packing house cord. The



Shipping Room.

lighting of the foundry is for the most part by means of type F automatic Cooper-Hewitt lamps suspended from the steel purlins. The mezzanine floor and storage rooms are lighted with incandescent lamps and Westinghouse receptacle plugs with 35 ft. extension cords are conveniently located for use in the cupola and dry oven.

MADEIRA-MAMORE RAILWAY.

The location and construction has so far followed quite nearly the lines of the original survey. On October 22 the track was laid and the engine was running on 60 kilometers southwesterly from San Antonio, Brazil, in the valley of the Madeira river. At that time the grading was nearly done on an additional 20 kilometers; the clearing was made to the 140 kilometer mark; the location, about half way, to 160 kilometers; the preliminary surveying party was at the 180 kilometer point. The total length from San Antonio, Brazil, to the head of navigation on the Mamore river, in Bolivia, is about 329 kilometers. No serious trouble from the Indians has yet occurred, and malarial troubles are fairly well under control.

LAND DEVELOPMENT FOR CIVIC BEAUTY.*

We are just beginning to understand the mission of the landscape gardener and the importance of educating the people to appreciate the beneficial influence of the beautiful outdoors on the moral as well as the physical conditions of society. Our parks have a great economic value inasmuch as they raise the standard of health, happiness and contentment of the people, especially in large centers of population, and we now have magnificent parks and boulevard systems not only in the East, but in the Middle West: Chicago, Kansas City, Colorado Springs, Denver and many other cities. In Oklahoma, on a site that was but a few years ago considered a hopeless waste, stands now a city of 50,000 inhabitants, with a number of 8, 10 and 12-story buildings in its business center, with 500 acres to be devoted to a 30-mile boulevard encircling the city, and 1,700 acres for parks, in different parts of the city, ranging in size up to 600 acres.

Railway station parks offer a great field for the landscape gardener. In the past little has been done but the planting of tender greenhouse material, which is generally grouped into more or less appropriate designs. This is not landscape gardening in its proper sense. It is also quite expensive and transient, as the beds have to be renewed every year and at best only last a few months in this latitude, leaving the ground bare and unsightly from the time of the first frost in fall till the warm weather in May. The landscape gardener uses hardy material, such as trees, shrubs and hardy herbaceous plants. This material is cheaper and the plantings perennial, and it gives a more natural effect and is attractive the year around.

Besides the ornamental, the emergency and economic plantings play an important part in railway gardening, such as screens for shutting out unsightly features which are beyond the control of the railway management, hedges along the property lines, snow hedges to protect cuts from filling up with snow and lastly timber plantings for posts, crossties and telegraph poles.

The Santa Fe has carried out the simple plan of using hardy plants for the embellishment of station grounds and has improved most of the larger stations in this manner. Several are more than one acre in extent. This area of well-kept rich green turf fringed by a background of masses of shrubs with a varying skyline is a picture long remembered by the weary traveler. The Union Pacific maintains well-planted station parks and it is branching out into the culture of timber.

Home Grounds.—The proper planting of trees, shrubs, vines and hardy perennials for the adornment of the home grounds extends the habitation beyond the mere walls of the house, and makes a large and grand living room outdoors, and a pleasant sight for the passerby. It is in the reach of every farmer to have a beautiful green lawn with a fringe of shrubs and a few trees to give shade and coolness during the hot summer days. He can thus forestall the discontent with farm life of the growing sons and daughters.

*Extracts from a paper read before the National Farm Land Congress at Chicago, November 18, 1909, by E. F. A. Reinisch, Consulting Landscape Gardener of the Atchison, Topeka & Santa Fe.

Shop Kinks.

TWELFTH COLLECTION. (First Prize).

BY F. C. PICKARD,
Assistant Master Mechanic, Cincinnati, Hamilton & Dayton,
Indianapolis, Ind.

STAYBOLT BREAKER.

This tool, shown in Fig. 1, will break three 1-in. staybolts at a single stroke. It consists of a 5-in. pipe, into which a 12-in. plunger is fitted. The two ends of the pipe are connected by smaller piping with a three-way cock, to the handle of which a connection reaches down to a second three-way cock near the end of the cylinder. The device is suspended outside of the line of the water leg, and the chisel, with a 12-ft. stem, is inserted at one end. The hook or chisel end is placed against the staybolt and air admitted to the back end of the cylinder, which throws the plunger violently forward. The blow of the plunger is cushioned by the air and a rubber pad placed at the delivering end of the 5-in. pipe.

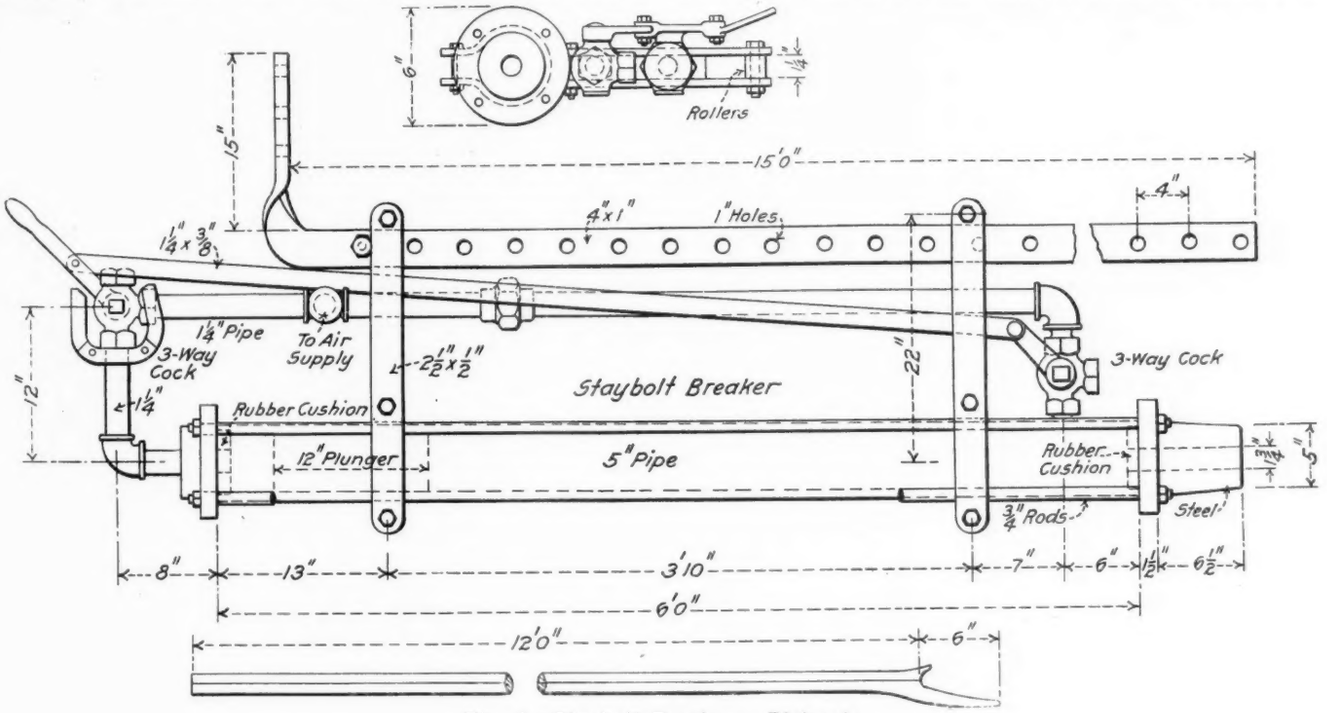


Fig. 1—Staybolt Breaker. Pickard.

BORING BAR HOLDER.

Fig. 2 shows a boring bar holder used in the place of the ordinary tool posts on a lathe. It has a T-head bolt by which it is clamped down, and the boring bar is held by two set screws as indicated.

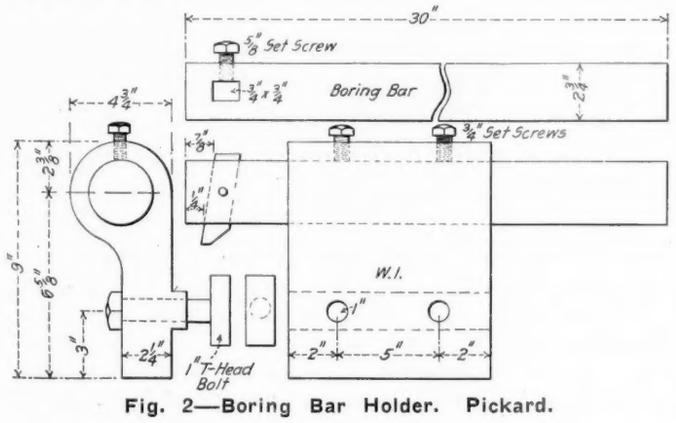


Fig. 2—Boring Bar Holder. Pickard.

TRANSFER CARRIAGE FOR MOUNTED CAR WHEELS.

Fig. 3 represents a car wheel transfer carriage, used for moving mounted wheels. Two of these trucks are operated together. The arc which sets over the wheel is grooved to receive the collar on the journal. When the handle of the truck is raised the different arms slip beneath the gear, and by bringing the handle down again the wheel is raised from the floor. By using one of these trucks at each end of the axle, wheels and axle can be transferred to any convenient place, and the trucks are of such shape that they can be run under a car or across the track so as to bring the wheels in proper position.

WHEEL AND PLATE TRUCK.

A truck for carrying car wheels or boiler plates, and arranged so that the plate is swung between the wheels and the handle and held from supports beneath, is shown in Fig. 4. The wheels are 50 in. in diameter, and the arc over the top will take boiler sheets of moderate size.

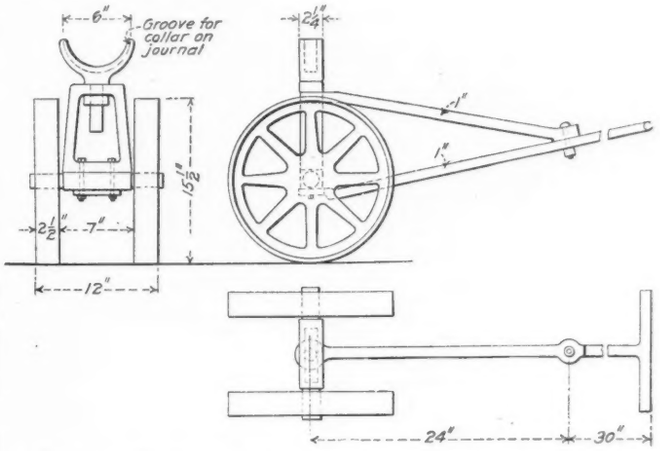


Fig. 3—Transfer Carriage for Mounted Car Wheels. Pickard.

FLUE HOLE CUTTING TOOL.

Fig. 5 shows a tool for cutting flue sheet holes. The taper shank is made to fit the socket of a drill press. At the end of the bar the cutter C slips over the end of the shank, to

which it is secured by a pin or key. The bottom of the cutter is fluted similar to a milling cutter and it operates in the same way. This tool will drill 200 holes in a ½-in. flue sheet in about one hour and forty-five minutes.

DEVICE FOR PLANING ROD BRASSES.

Fig. 6 shows a device used for planing strap rod brasses. A small angle plate is secured to a table, planer or shaper

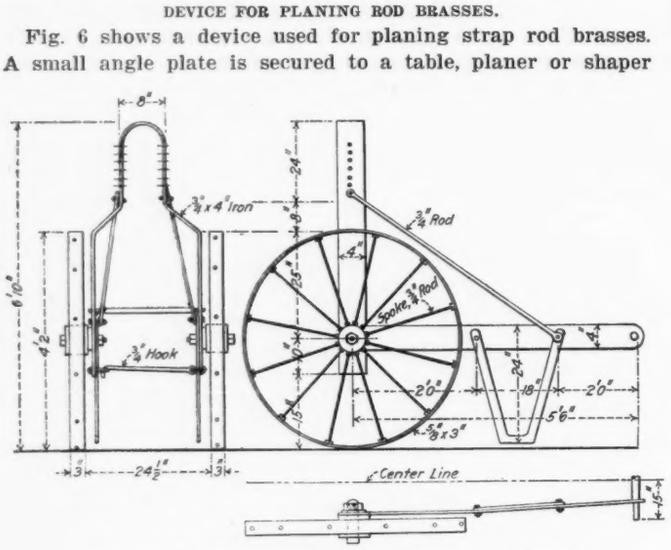


Fig. 4—Wheel and Plate Truck. Pickard.

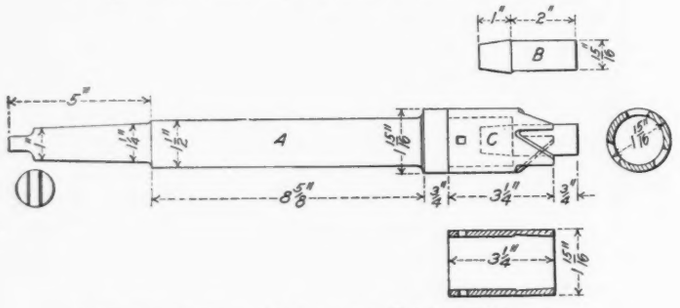


Fig. 5—Flue Hole Cutting Tool. Pickard.

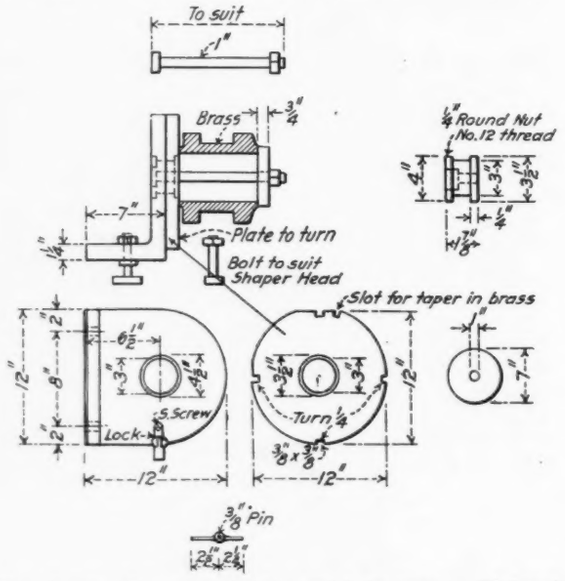


Fig. 6—Device for Planing Rod Brasses. Pickard.

bed. An index plate provides for changing the position of the brass. This plate has four slots set 90 deg. apart. After the brass is secured in position it is not necessary to readjust it, but simply to remove the catch and revolve the brass and plate, the position being maintained by the catch. There is also a slot at one side for planing the taper ends. This device will greatly increase the capacity of the shaper on this class of work.

AIR HOSE MOUNTING MACHINE.

An outfit for mounting air hose is shown in Fig. 7. The two cylinders are used at right angles. The vertical one operates the clamp C, by which the hose is firmly held in position, and the horizontal cylinder holds the nipple or couplings fitted to the end of the piston rod. A single cock admits air to both cylinders, thus clamping and forcing the

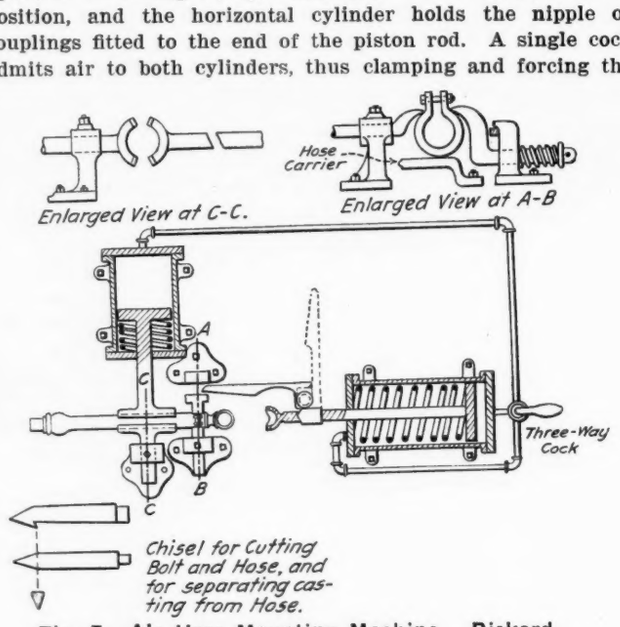


Fig. 7—Air Hose Mounting Machine. Pickard.

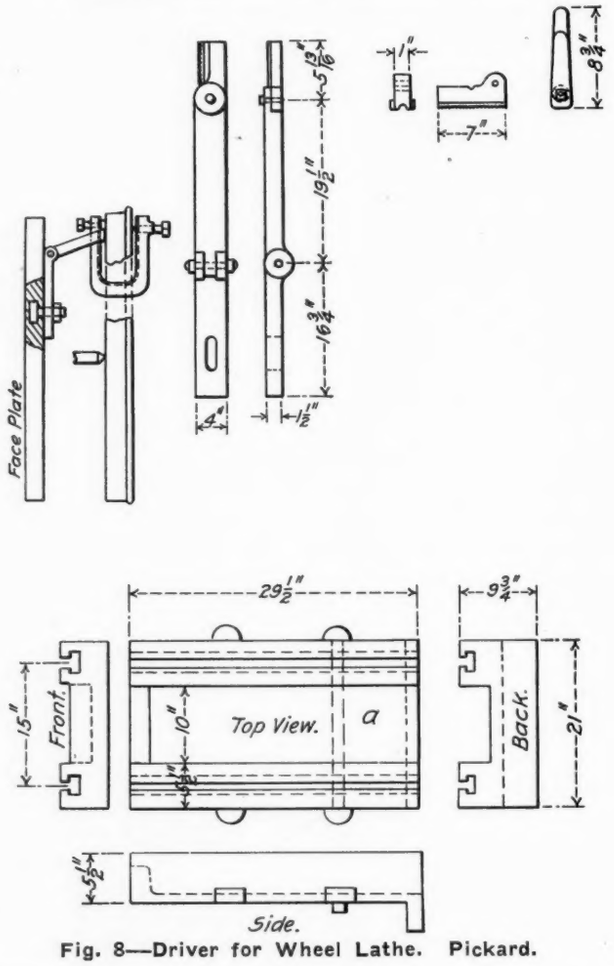


Fig. 8—Driver for Wheel Lathe. Pickard.

nipple in at the same time. The horizontal cylinder is also equipped with a knife, shown in two positions, with which the hose is cut from the couplings.

DRIVER FOR WHEEL LATHES.

In Fig. 8 is shown a driver used on a wheel lathe. It con-

sists of a bar with two pieces hinged at right angles. The lower hinge portion is bolted to the face plate through a slotted hole, the whole device taking the position indicated in the engraving. The driver proper, the bearing face of which is toothed, is first held tightly in position by the C clamp and the lathe started. The work is then tightened up and the driver adjusts itself to a firm bearing. The device is made of forgings, and is easily and quickly applied.

PAINT SPRAYER.

Fig. 9 shows an arrangement for spraying paint over cars and locomotives. It consists of a nozzle leading from an air

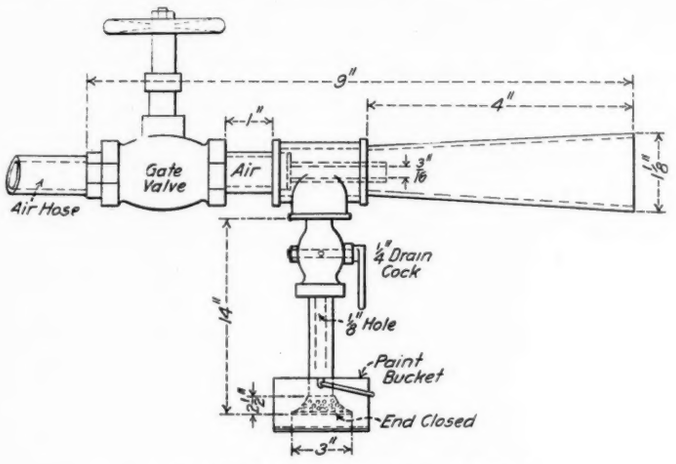


Fig. 9—Paint Sprayer. Pickard.

pipe into the bottom of a funnel, into one side of which a pipe is led from the paint supply. This latter pipe has a strainer in one end, and the flow of paint is controlled by a small cock. Admission of air through to the nozzle creates an action similar to that of a locomotive injector, and the stream of paint spreads as it passes out of the funnel-shaped nozzle.

HEAVY DUTY TOOL HOLDER.

Fig. 10 shows a tool holder for use on a heavy duty lathe. It is made of an ordinary forging, the one shown being intended to receive 1¼-in. steel. A saving of about 50 per cent. is effected by being able to use a smaller piece of high-speed

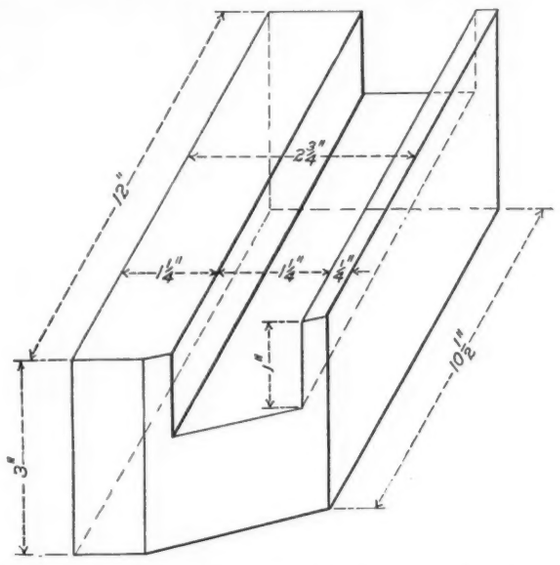


Fig. 10—Heavy Duty Tool Holder. Pickard.

tool than were the holder not employed. The same cut and point of the tool is maintained, together with a considerable increase in the strength of the tool.

DOUBLE TOOL HOLDER.

Fig. 11 shows a double tool holder, used principally for

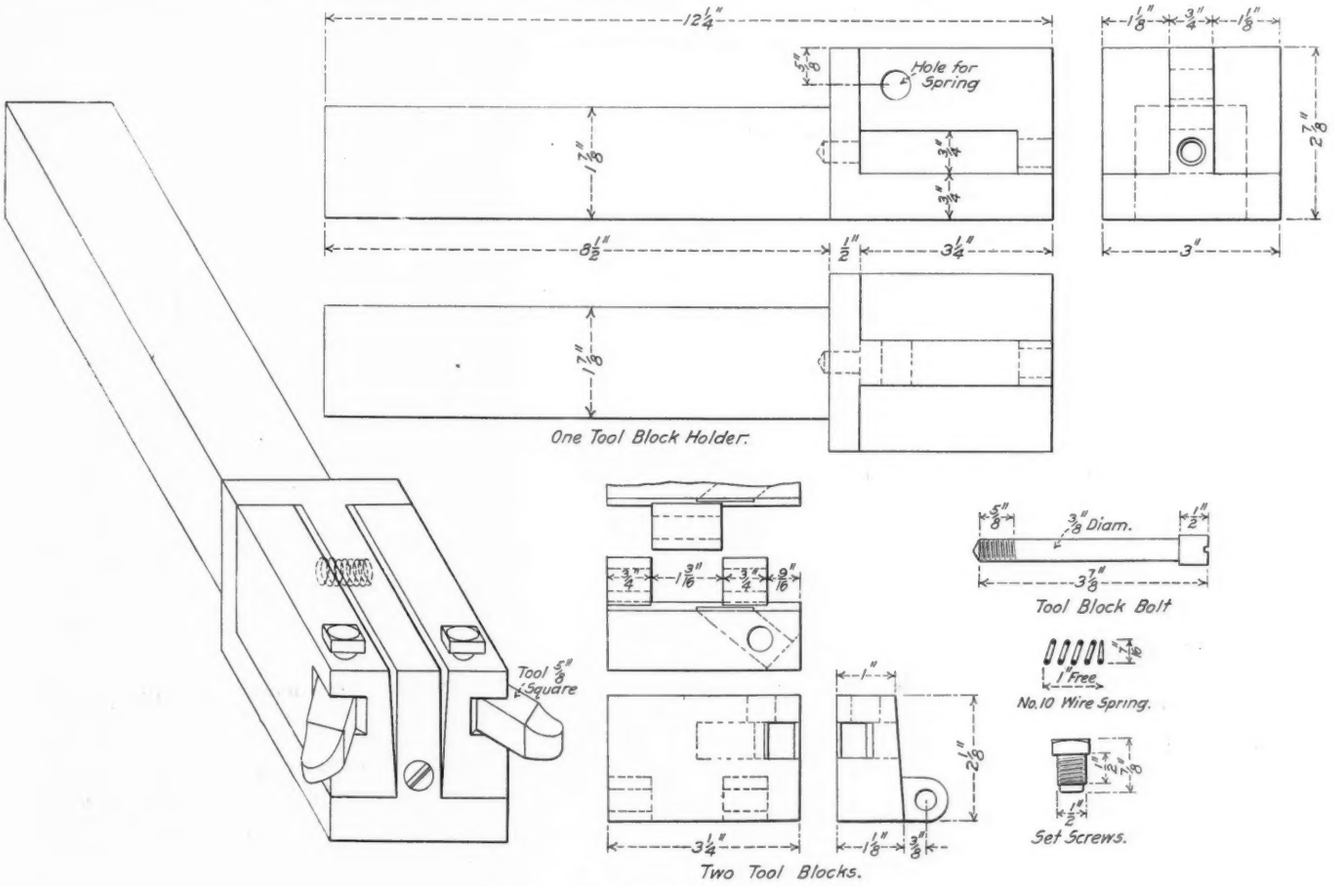


Fig. 11—Double Tool Holder. Pickard.

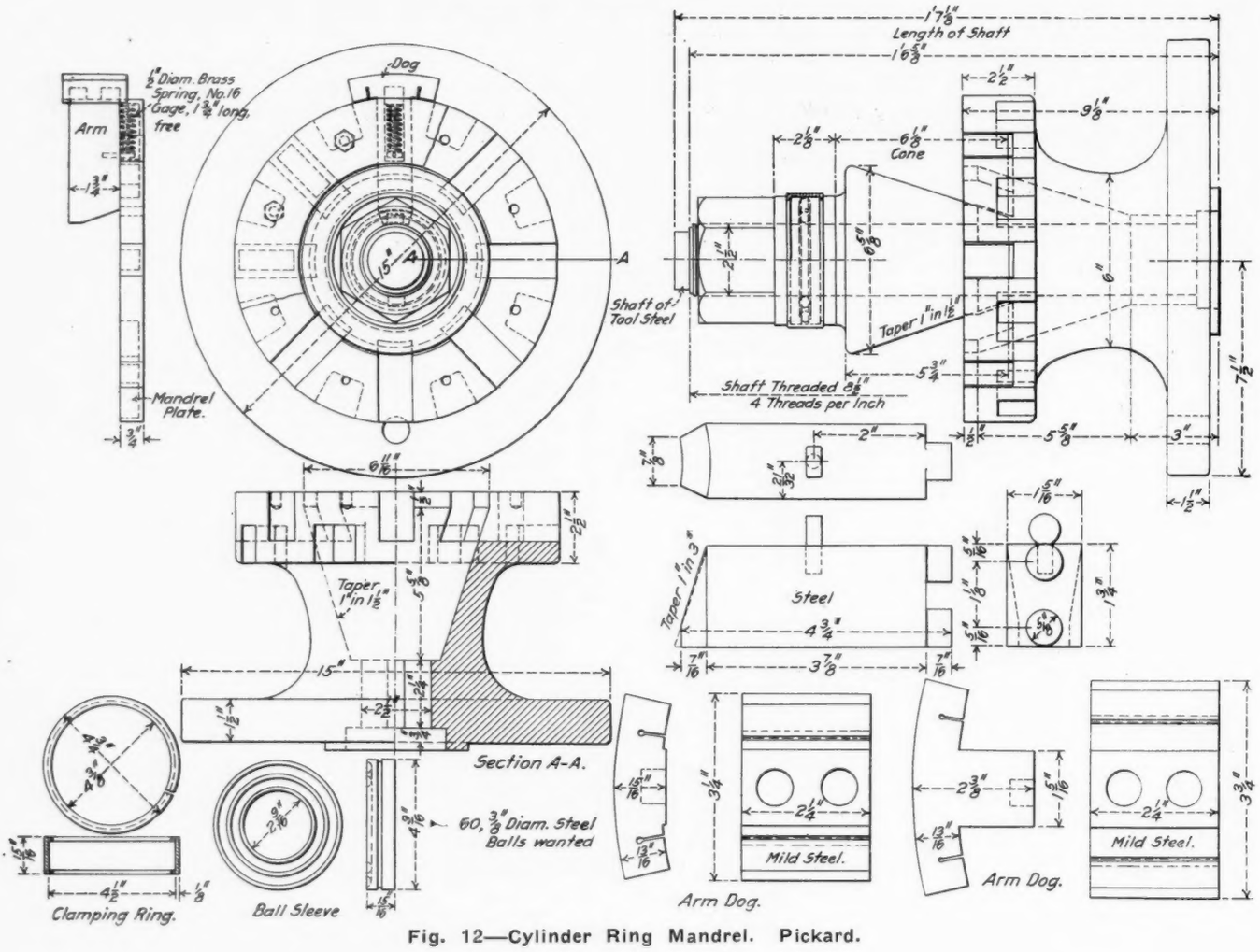


Fig. 12—Cylinder Ring Mandrel. Pickard.

finishing shoes and wedges. The tube blocks inserted in the end of the holder are pivoted on ⅜-in. pins. These blocks are held in position by the spring shown. Both sides of the frame fit are finished at the same time, and the spring arrangement provides release for all reverse movements. This tool has been successfully used in these shops for several years.

CYLINDER RING MANDREL.

Fig. 12 shows an expanding mandrel for holding cylinder rings during turning. It consists of a casting bolted to the face plate of the lathe, which casting has a conical opening on its front face. Extending down to this opening are a number of small arm dogs, which are expanded by driving the cone into the tapered hole. This cone is held up by the tail stop, and in expanding the mandrel holds the ring rigidly and in position for turning.

FLUE SWEDGING MACHINE.

Fig. 13 shows a flue swedging machine, which is made from a 10-in. brake cylinder with an 8-in. stroke fitted for a ⅜-in. spring. The machine has two sets of dies. By use of exhaust air the scales are blown off on releasing the machine. The foot pedal operates a three-way cock, which controls the flow of air.

PNEUMATIC TOOL POST.

A pneumatic tool post, as shown in Fig. 14, has been used for several years in the Grand Rapids shops of the Pere Marquette. The time of changing tools in the lathe has been reduced from an average of five minutes to one minute, and, in addition to this, difficulties with broken studs, strapping of wrenches, etc., has been eliminated. The air cylin-

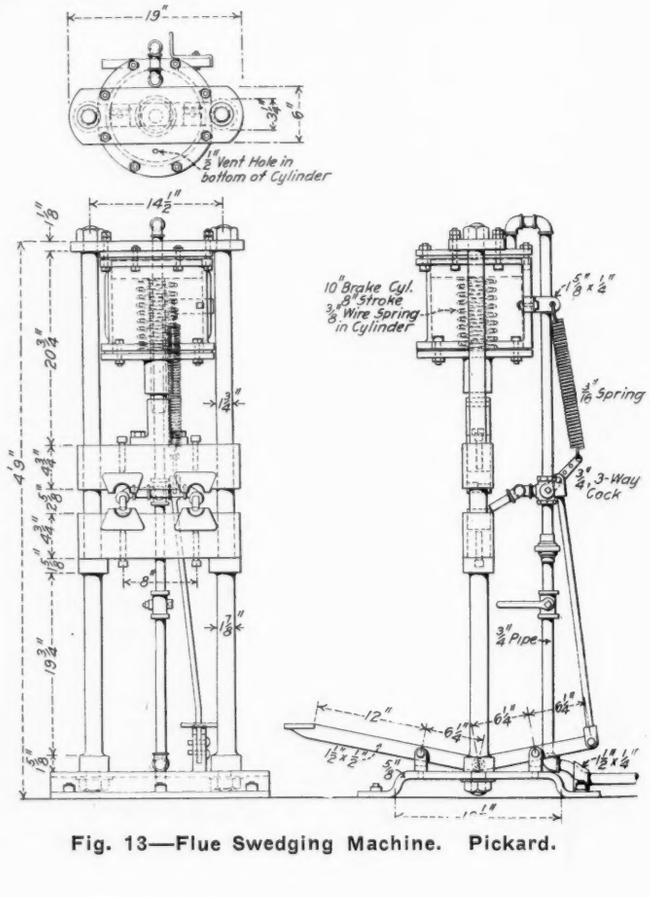


Fig. 13—Flue Swedging Machine. Pickard.

der, which has a 5¼-in. stroke, is fastened to the carriage by four long studs, 7½ in. in diameter. The piston rod connects the two cam levers, which force the holder plates down upon the tool. The four springs act to release the tool when the pressure is released in the cylinder. The tool holder shown in Fig. 10 is used with this device. The springs hold the

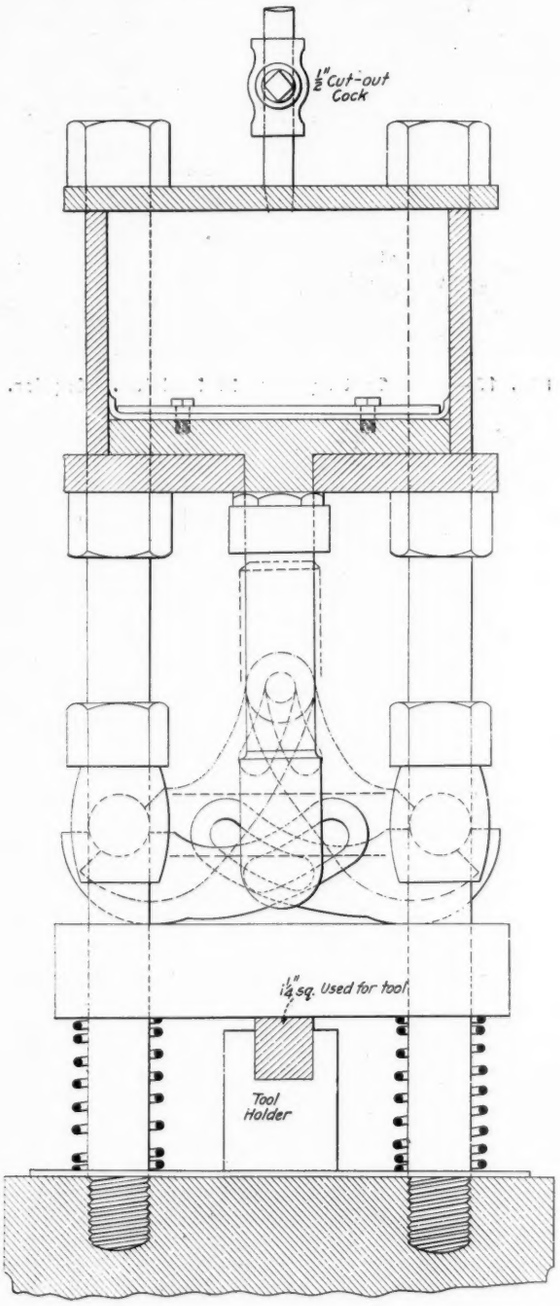


Fig. 14—Pneumatic Tool Post. Pickard.

tool plate about ½ in. from the tool, giving ample room for removal or adjustment.

LATHE GRINDER.

Fig. 15 shows an arrangement for adjusting an emery wheel to an ordinary lathe for grinding purposes. The wheel is carried by bearings running in a block bolted to the carriage instead of a tool post. The shaft of the wheel has a small pulley about 4 in. in diameter, which is belted to the line shaft. The tool is used for grinding motion work pins particularly. The overhead work consists of a countershaft, on which is mounted a 12-in. in diameter by 36-in. long pulley to provide for the travel of the belt, due to the

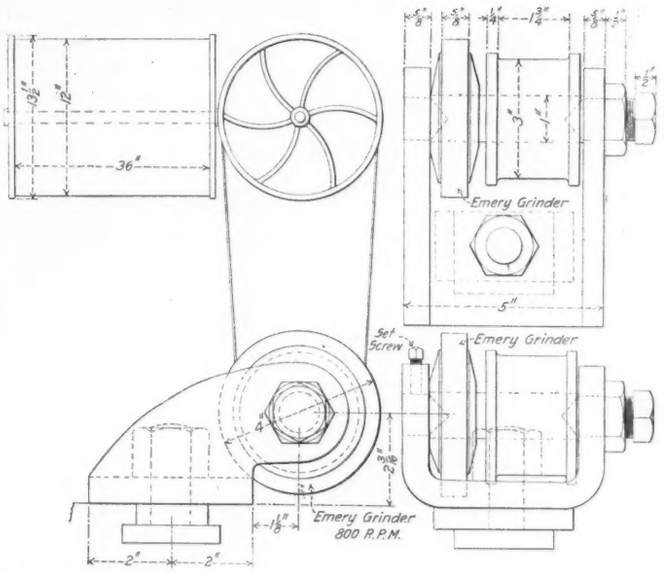


Fig. 15— Lathe Grinder. Pickard.

movement of the carriage. The body of this device is an ordinary forging, fitted with the shaft, which has pointed center bearings to take up all lost motion. This device can be made to fit a lathe. It is especially useful on case hardened work in shops which have no grinder.

THIRTEENTH COLLECTION. (Second Prize).

BY W. H. SNYDER,
Assistant General Foreman, New York, Susquehanna & Western, Stroudsburg, Pa.

ROCKER ARM BOSS AND SOLID OIL CUP TURNING TOOL.

This tool, shown in Fig. 16, is used for turning rocker arm bosses or oil cups made integral with the rod forging. This tool, as is the case, with one exception, of all of the tools in this collection, was designed by W. H. Snyder. The end A,

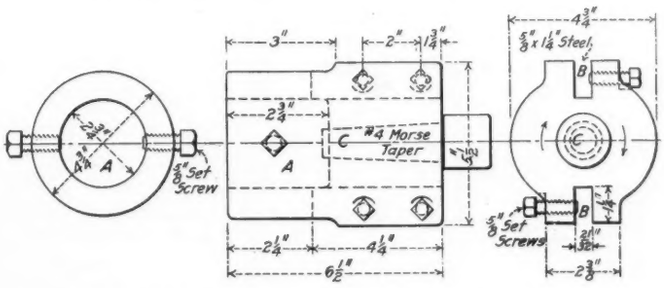


Fig. 16—Rocker Arm Boss and Solid Oil Cup Turning Tool. Snyder.

or top of the tool, is bored to fit the drill press spindle to which it is secured by two ⅝-in. steel set screws. The slots, B, B, are made to receive the cutting tools, which are ⅝-in. x 4-in. high-speed steel, and secured by ⅝-in. steel set screws. The hole C is made to fit the No. 4 Morse taper of the plugs, the diameter of the guide ends of which vary according to that of the pin hole in the rocker arm or the inside diameter of the oil cup. This projecting end acts to steady the tool.

ASBESTOS GRINDER.

This device, shown in Fig. 17, is one easily and cheaply made, and one which has proven very efficient for grinding into a pulp old and broken section magnesia or asbestos boiler lagging. Both upper and lower boxes are made of wood.

The division plate is made of thin sheet iron, perforated with ¾-in. square meshes. The three-blade cutter is made from an old brake wheel, the cutting edges of which, being vertical, work in connection with the perforations in the plate. An air motor is fitted to the upper end of the spindle and the lagging is fed into the top box, and the resulting pulp is removed from the lower one.

PEDESTAL V-BLOCKS FOR PLANING CROSSHEADS.

A very simple but efficient design of pedestal V-blocks for

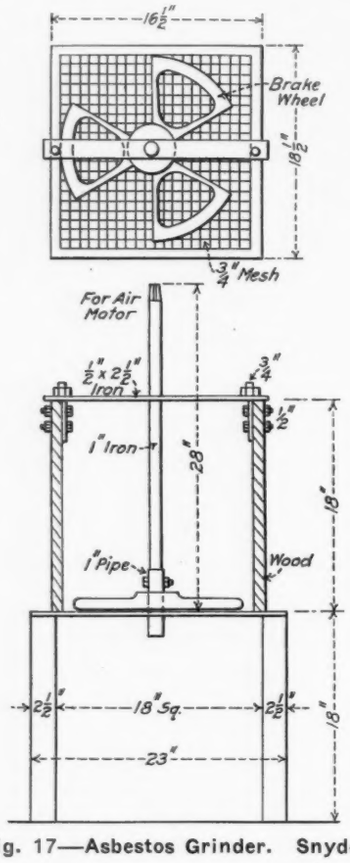


Fig. 17—Asbestos Grinder. Snyder.

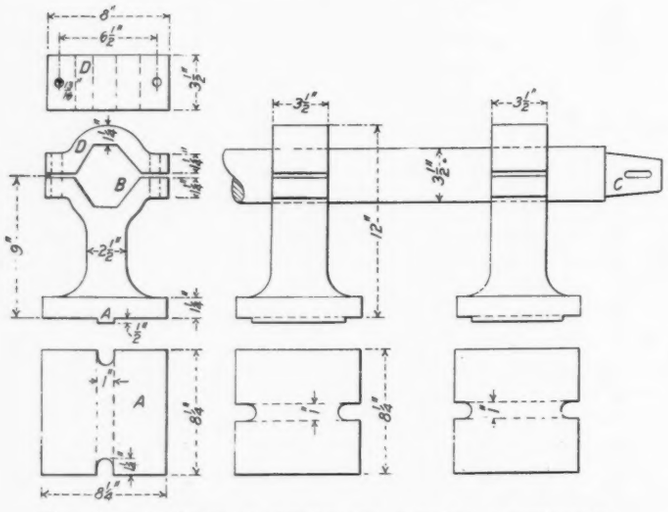


Fig. 18—Pedestal V-Blocks for Planing Crossheads. Snyder.

planing crossheads is shown in Fig. 18. The base lugs are made to fit the planer slots, and the crosshead is planed and mounted upon the piston, and perfect alignment is insured.

FLUE CUTTING TOOL.

The halftone, Fig. 19, and the complete details, Figs. 20, 21 and 22, show a device for cutting out flues. The holder

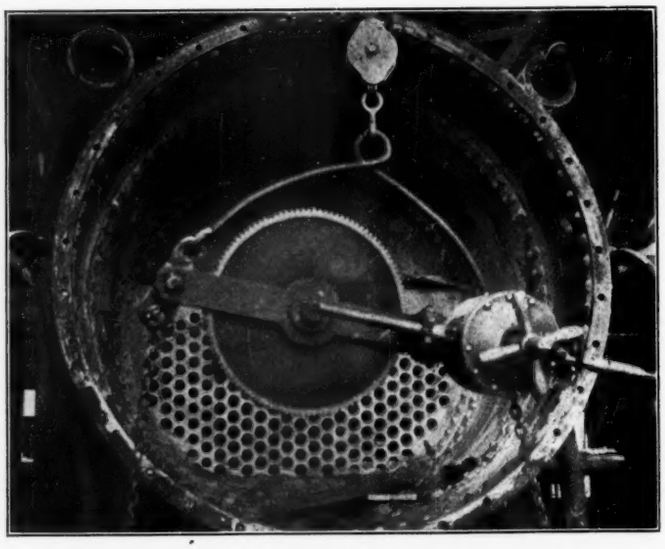


Fig. 19—Flue Cutting Tool in Position. Snyder.

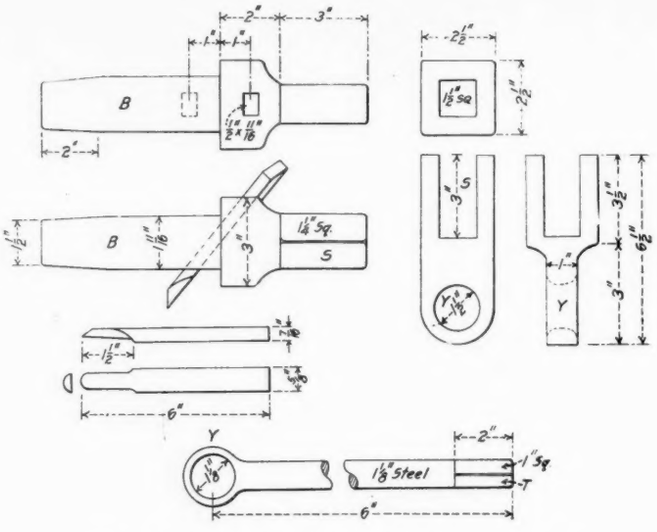


Fig. 20—Flue Cutting Tool Details. Snyder.

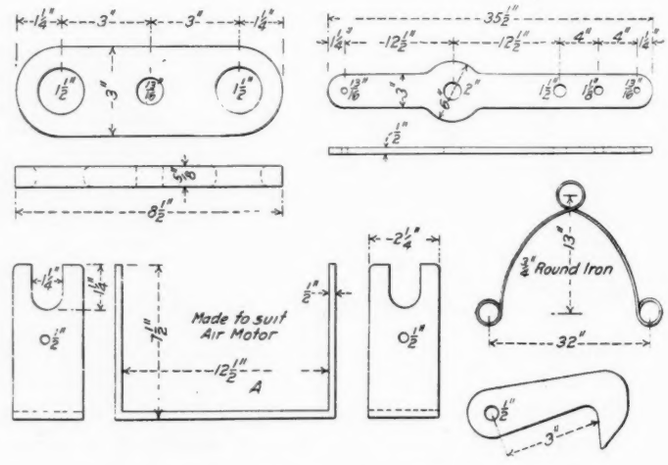


Fig. 21—Flue Cutting Tool Details. Snyder.

is first inserted in the flue, after which the cutting tool is placed and the point driven through the tube wall. Only one revolution is necessary for the cut-off. The halftone shows clearly the assembled device and the method of swinging it with the block and fall. The large gear wheel is mounted on the spindle which carries the cutting tool, and the power

of the motor is transmitted through the gears V and W. This arrangement greatly increases the power and at the same time reduces the speed. The flexibility of this device for adjusting it to the different flues is seen in the halftone

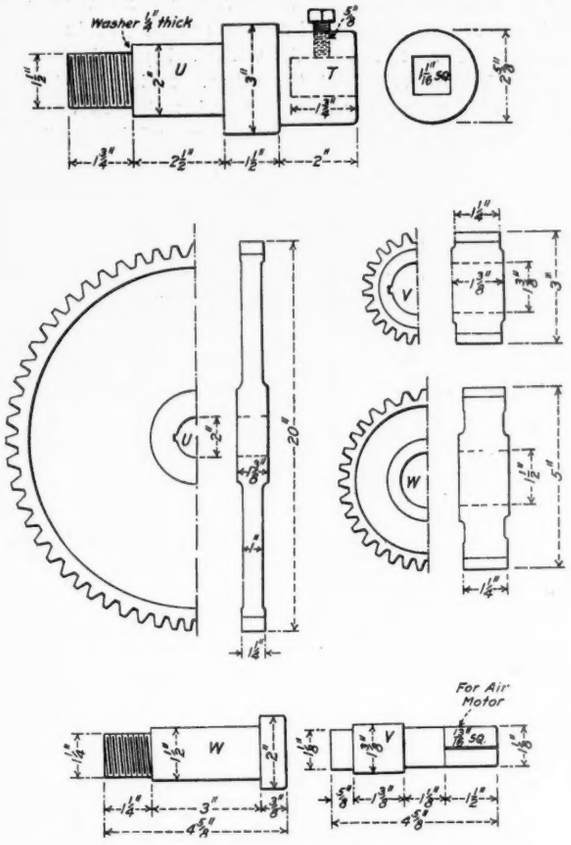


Fig. 22—Flue Cutting Tool Details. Snyder.

illustration, and this one feature should recommend it as a simple and rapid flue cutting tool.

SPRING CLIP FORGING DIES.

In Fig. 23 is shown a device for facilitating the work of making spring clips. Th lower block or die is held on the hammer anvil by the ⅛-in. boiler plate sheets which are

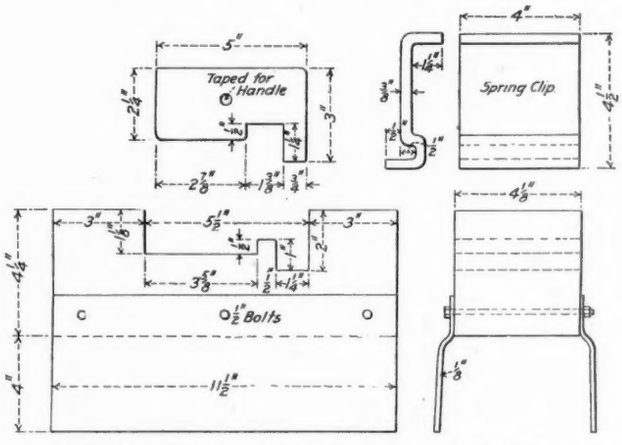


Fig. 23—Spring Clip Forging Dies. Snyder.

fastened to the die by ½-in. through bolts. The top die is held by a handle tapped into it near its center. Spring clips of the shape are shown made of ⅜-in x 4-in. spring steel. The stock is cut to the proper length, heated and then placed across the lower die. The upper die is forced down by one or two blows of the steam hammer. This device was designed by T. F. McDonald, blacksmith foreman at Stroudsburg.

FOURTEENTH COLLECTION.

BY A. S. DAVIS,
Shop Foreman, Northern Pacific, Jamestown, N. Dak., Shops.

DROP PIT RAIL REMOVER.

Fig. 24 shows a handy and easily made arrangement for moving the heavy I-beams on which the rails are laid alongside of drop pits. It consists of a piece of 8-in. pipe, about 2 ft. long, capped at each end and fitted with an ordinary air piston packed with leather, the rod of which extends out

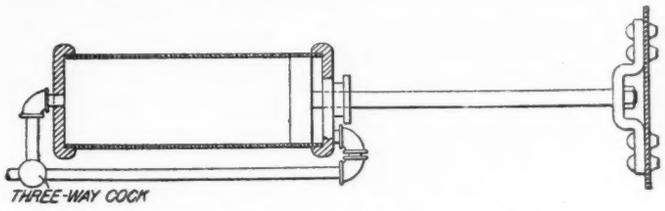


Fig. 24—Drop Pit Rail Remover. Davis.

through one head, which is bored and fitted with a gland and stuffing-box and takes hold of a bent bar at the end, which is in turn riveted to the web of the I-beam. The air connection is made as shown, with a three-way cock, by which air can be admitted to either end of the cylinder and exhausted therefrom. When the rails are in place the piston stands with its rod out, as shown in the engraving. After the wheels have been raised from the rail, air is admitted to the head and the rails are drawn bodily to one side, thus permitting the wheels to be dropped into the pit and removed.

WHEEL AND AXLE JACK.

Fig. 25 shows a small track jack, used for lifting heavy tender truck and engine wheels and axles, so that they may be

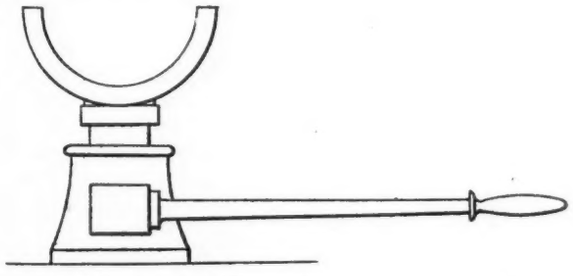


Fig. 25—Wheel Swinging Jack. Davis.

turned and run from one track to another when the tracks stand at right angles to each other. The jack is low, so that a wheel with its axle can be rolled over it when it is down. The cap is removed and a semi-circular yoke riveted in its place. This yoke is of such size as to grasp the center of the axle and may be made of 1-in. by 4-in. iron. The wheel and axle to be turned is rolled over it, the jack raised, lifting the wheels from the rails, when they are turned to the proper position.

CROSS-HEAD BABBITTER.

Fig. 26 illustrates a device used for babbitting two-bar cross-head gibs, so that they are ready for use without any

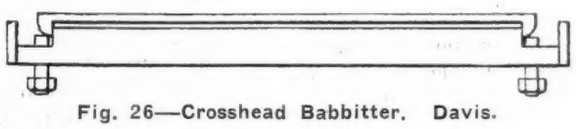


Fig. 26—Crosshead Babbitter. Davis.

finishing in the planer. It is made from a piece of 2-in. by 8-in. x 24-in. iron, planed off to fit the inside of the gibs. Four set screws are placed in it, one at each corner, for adjusting the thickness of the babbitt. The gib is laid on, as shown, and raised so that the proper thickness of babbitt will be provided by means of the set screws mentioned. The babbitt is then

poured into the open space, and when it is cold the work is done and ready for application without requiring any machine work whatever.

FIFTEENTH COLLECTION.

BY A. LOWE,
Canadian Pacific Railway.

TIRE HEATER.

This form of tire, Fig. 27, heater is used with gasolene. It is a simple contrivance, consisting of a reservoir about 9 in. in diameter and 24 in. long, with a pipe at the top for filling and one leading off from the bottom to the burner, which is shown at the right. Air is admitted to the top of the reservoir, thereby putting a pressure on the liquid and at the same time it comes down to the burner through the pipe on the outside. The mixture of air and gasolene is drawn out through the Y connection into the circular burner that surrounds the tire and is there ignited, heating the metal in the ordinary way.

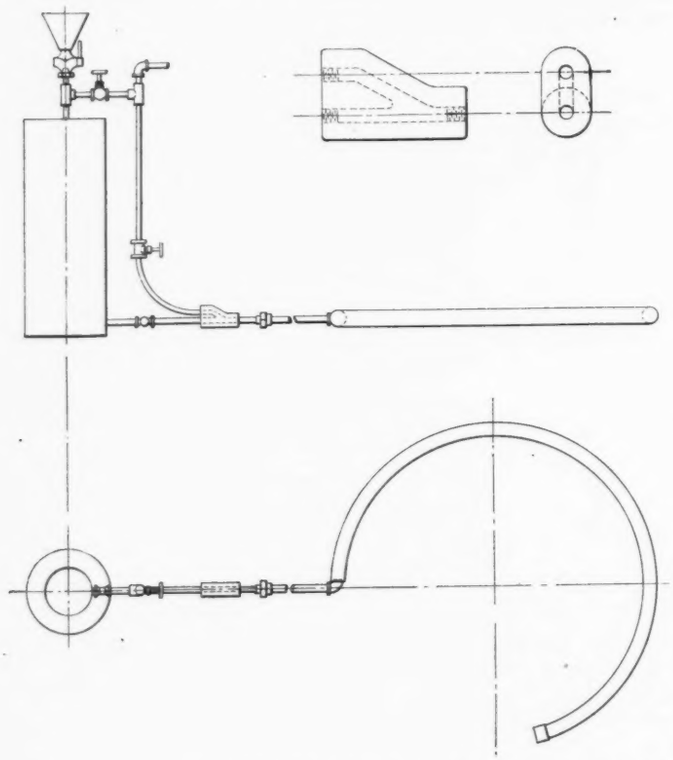


Fig. 27—Tire Heater. Lowe.

AIR HAMMER FOR DRIVING BOLTS.

The air hammer shown herewith, Fig. 28, consists of a cylinder 6 in. in diameter, into which is fitted a 3½-in. piston with packing grooves. Air is admitted from a tank to the bottom by suddenly opening the air cock on the pipe connection, thereby giving the piston the necessary impulse.

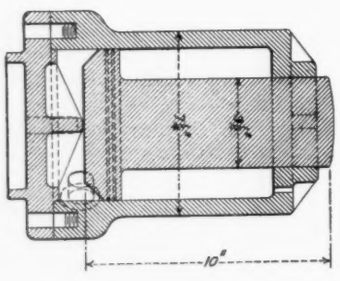


Fig. 28—Air Hammer for Driving Bolts. Lowe.

SPRING COMPRESSOR.

This device, Fig. 29, is for compressing the spring so that the driving or truck spring hangers can be put in position. It consists of a flat bar A with holes drilled at one end and a hinge hook C at the other. It is placed against the inside of the frame and a key B inserted in one of the upper holes, and the chain drawn down and looped into the hook, thus compressing the spring and holding it until the hanger is put in place.

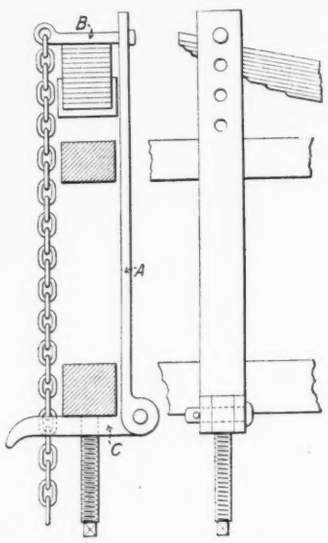


Fig. 29—Spring Compressor. Lowe.

GASOLENE HEATING FURNACE.

Fig. 30 shows a stand with a basin filled with cement upon which the material to be heated is laid, with the gasolene torch burners on either side. The gasolene is furnished from the tank beneath by being forced through to the burners by air pressure, where it is regulated by a needle valve. This apparatus, it will be seen, is portable, and connections can be made at any point with the air pressure pipes of the shop.

A modification is also shown in a similar burner which is used for heating plates or rods where the work has to be done in position. It can also be used for brazing purposes. Its operation is exceedingly simple. A reservoir about 9 in. in diameter and 14 in. long is fitted with a pipe at the top, under which it can be filled and under which air can be admitted for pressure purposes. The exit pipe enters from the top and extends to within a very short distance of the bottom of the tank, so that pressure applied to the upper surface of the liquid forces it up through and out of the burner.

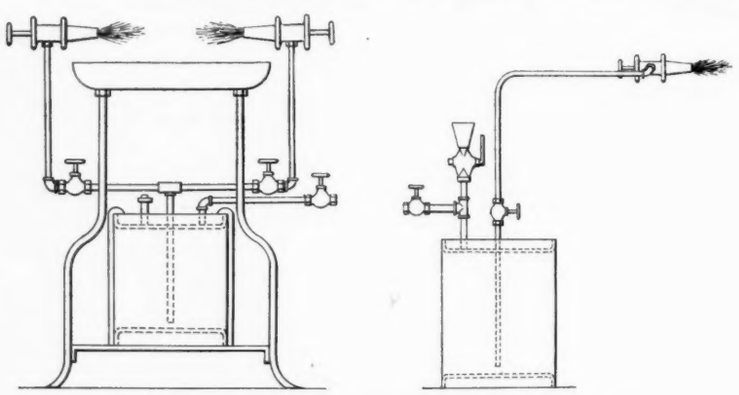


Fig. 30—Gasolene Heating Furnaces. Lowe.

SIXTEENTH COLLECTION.

BY E. J. MCKERNAN,
Tool Supervisor, Atchison, Topeka & Santa Fe, Topeka, Kan.

CROSSHEAD BABBITTING DEVICE.

The illustration herewith, Fig. 31, shows a device for babbitting crosshead shoes, after which planing is not necessary. A material reduction may be made in the cost of babbitting crosshead shoes, and the operation is performed in one-fourth of the time required by the old method.

Two tapered castings are arranged with grooves on their inside faces to receive a central wedge, the three parts constituting the core. By adjusting the wedge the width of the core is increased or decreased to correspond to the size of the shoe and the amount of babbitt metal desired. An adjusting screw is provided for this purpose. The end plates are hinged and close up the ends, to retain the babbitt, and are clamped in position by screws. Strips are also clamped to the core above the crosshead shoe, closing the mold and forming the upper babbitt edge along the flange of the shoe. All parts are arranged to be handled easily and adjusted quickly. As soon as the molten babbitt hardens the device is removed and the crosshead shoe is ready to be applied.

The time required for finishing one shoe of a large crosshead with the device is 10 minutes. Under the old methods 42 minutes were required to babbitt and plane up one shoe. As about 4 lbs. of babbitt were removed in the planer, the total saving accomplished by using the device is $1.13, of which $0.88 is in material and $0.25 in labor. On 1936 crossheads babbitted last year on the Santa Fé, a total saving of $2,191.55 was made by using the device.

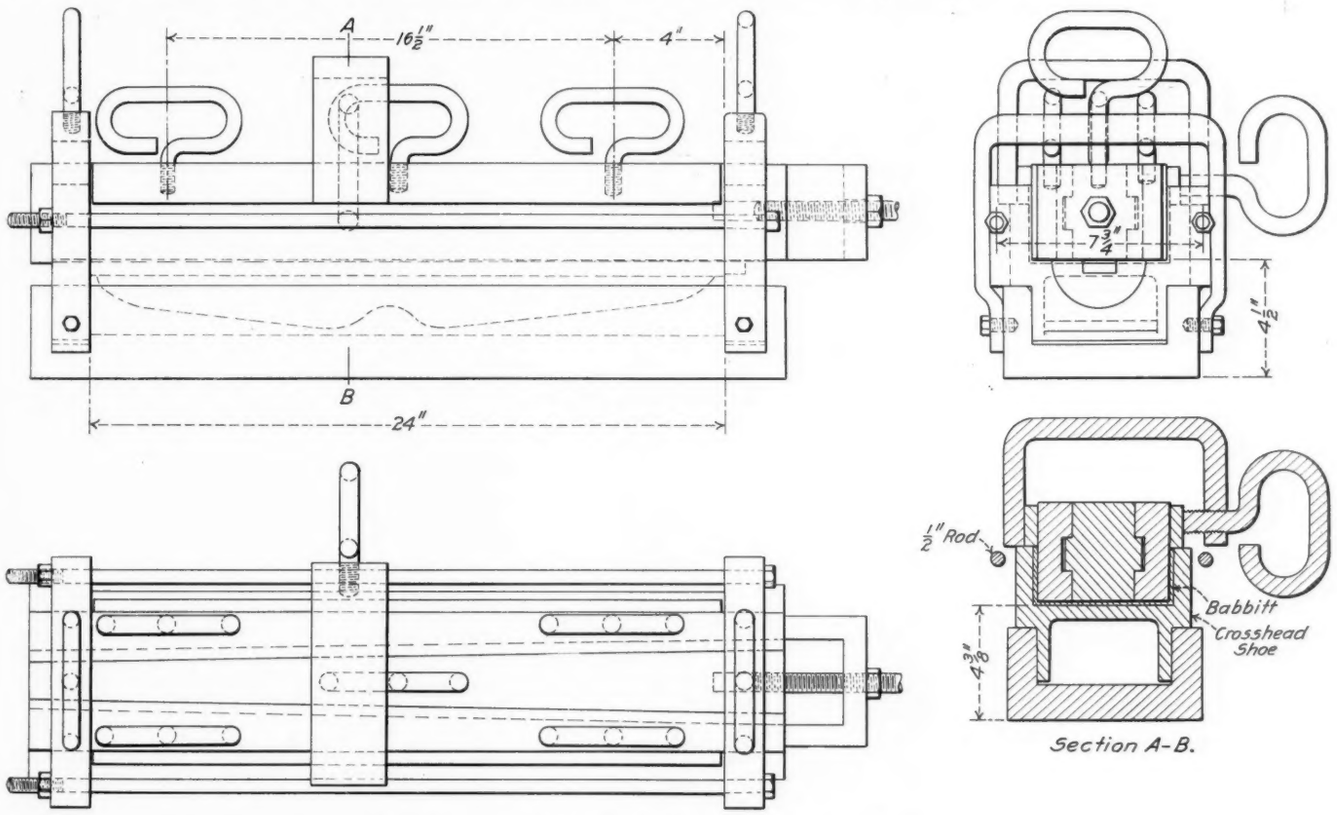


Fig. 31—Crosshead Babbitting Device. McKernan.

BELT CLAMP AND STRETCHER.

A very efficient belt clamp and stretcher is illustrated in Fig. 32. The device consists of two clamps 12½ in. long, made of 2-in. angle iron. Two parallel iron strips with teeth cut in the outer edges are riveted to the clamp, which carries an operating lever and two dogs. When the lever is operated back and forth the clamp is advanced and the belt stretched a corresponding amount. With one of these clamps a man can take care of all belts of 6-in. width and under, and, as the operation of stretching belts is performed very quickly, the expense of belt maintenance will be largely reduced by introducing such a device into shop practice.

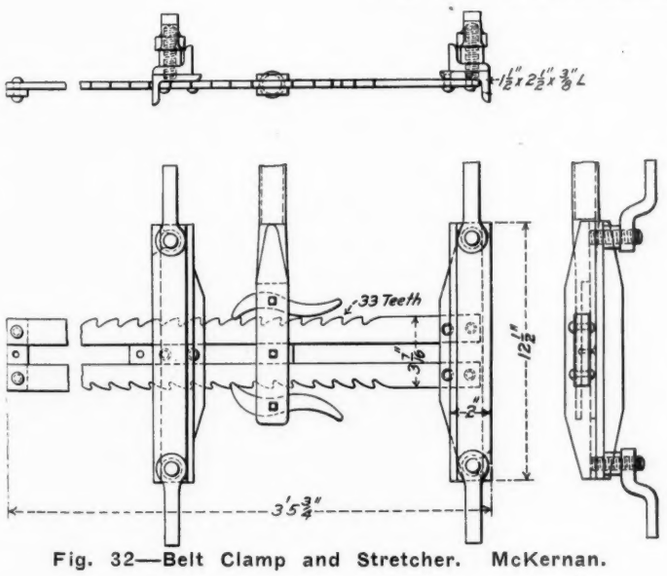


Fig. 32—Belt Clamp and Stretcher. McKernan.

CRANK PIN TURNING MACHINE.

The machine shown in Fig. 33 is designed for returning side and main rod crank pins which have become untrue in service. The machine consists of an outer frame with interior mechanism for driving two turning tools. The frame has points for adjusting the machine to the centers of the axle and pin, in order to correctly establish its position. The tools are driven by an air motor through gearing independently of each other, and are fed automatically. The machine is adjustable to all sizes of pins.

With the machine one man can turn up and finish a crank

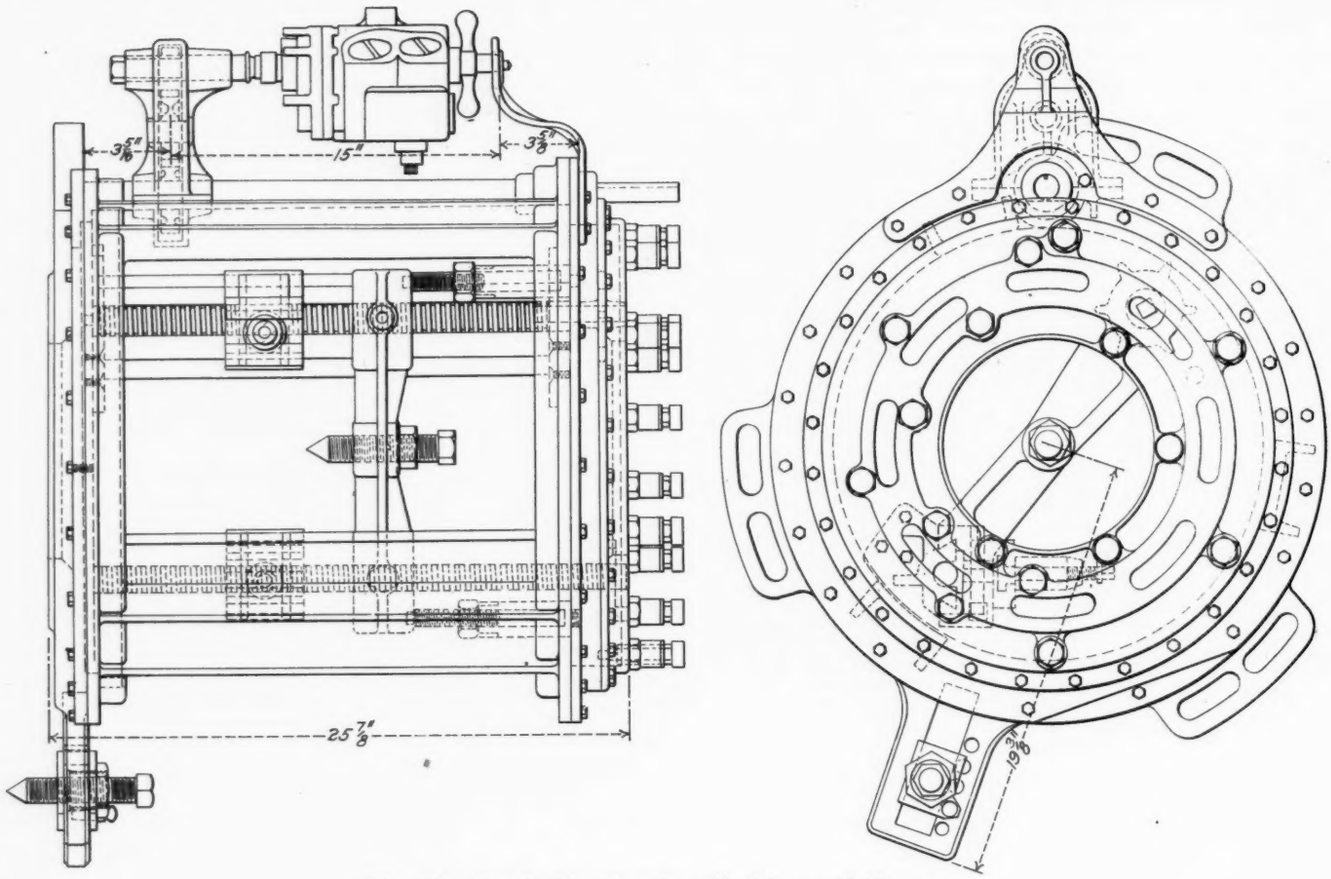


Fig. 33—Crank Pin Turning Machine. McKernan.

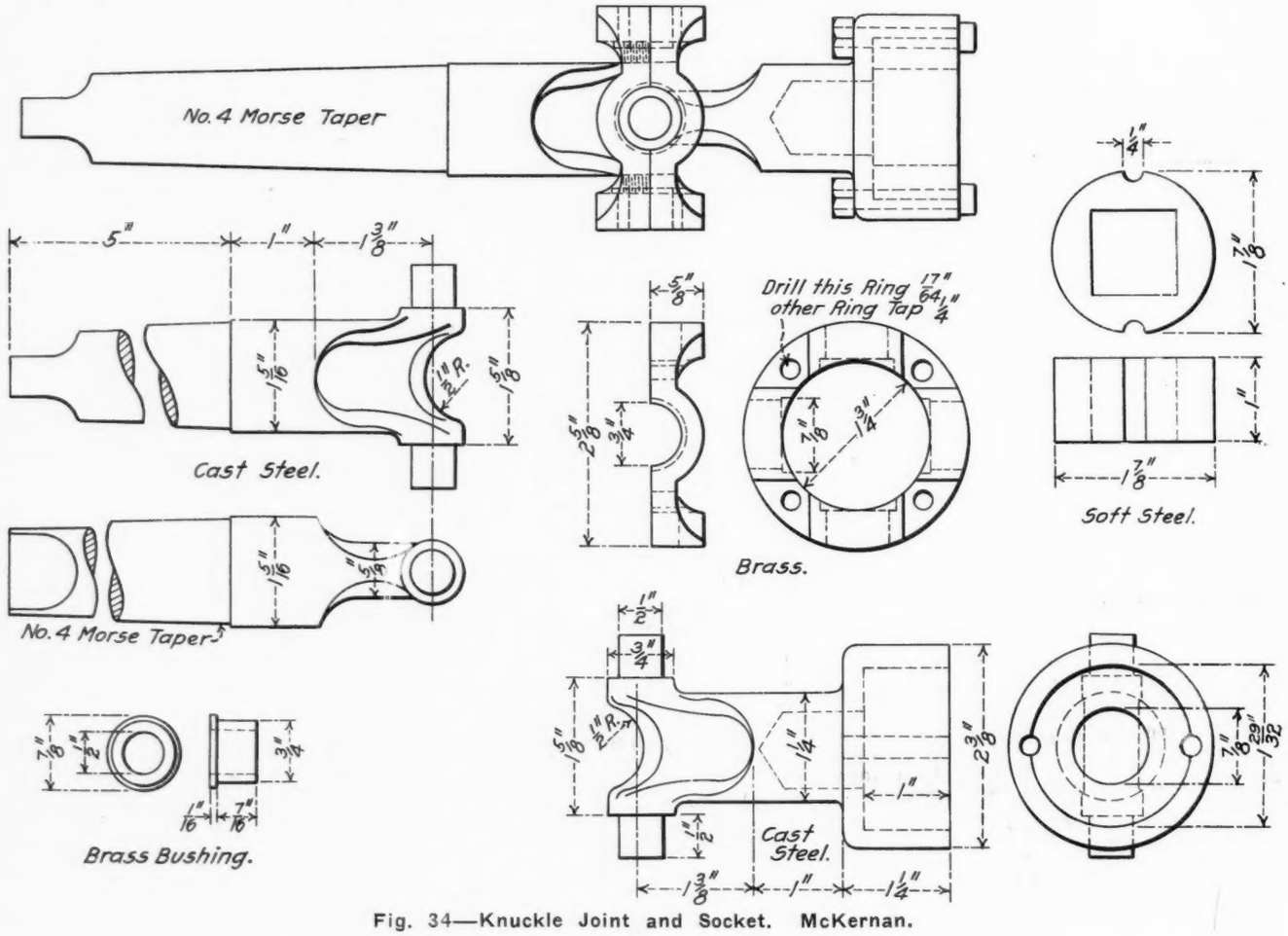


Fig. 34—Knuckle Joint and Socket. McKernan.

pin in about 3½ hours, at an average cost of $1.14. By hand, with chisel and file, it requires a skilled mechanic on an average of 9 hours to true up a pin, at a cost of $3.60. With the machine the pins are round and in correct throw and quarter, which is not usually the case when finished by hand. About 300 pins are turned up each year, and at the rate of $2.46 per pin a considerable saving is effected by the machine, and the quality of work is far superior.

KNUCKLE JOINT AND SOCKET.

Fig. 34 shows a universal or knuckle joint and socket for use in reaming with an air motor when the latter cannot be used directly over the reamer. When drilling or reaming in close quarters, where there is not sufficient room to use the motor direct, one of these sockets with knuckle joint will enable a motor to be used. Otherwise the work would have to be performed by hand, which is much slower and more expensive.

One end of the knuckle joint is turned to the regular No. 4 Morse taper, to fit in the air motor, and the other end is an adjustable socket for all reamers. The socket is turned to receive steel centers, with square holes of different sizes for reamer shanks of various dimensions. These are held in place by two screws and are quickly removed or replaced. The device is of solid construction, and has proved to be extremely useful and handy in shop work.

SEVENTEENTH COLLECTION.

BY A. D. PORTER.
Shop Efficiency Foreman, Canadian Pacific, West Toronto, Canada.

BOLT EXTRACTOR.

The extractor shown in Fig. 35 is used for removing bolts from locomotive frames, and is one of the most useful tools in the shop. It is made of an old crank pin machined as shown in the sketch. The barrel is filled with thick oil, the plunger being withdrawn to its full back position before

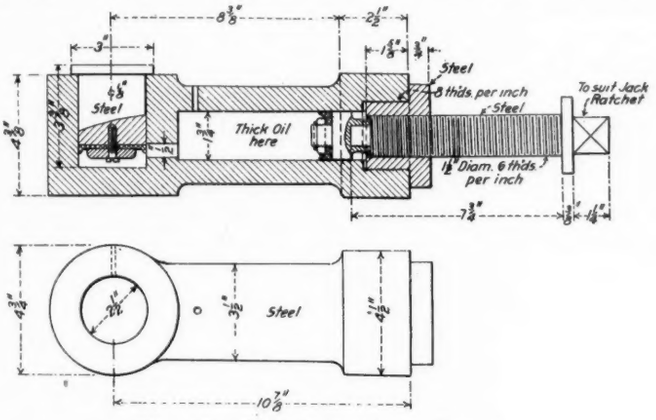


Fig. 35—Bolt Extractor. Porter.

filling. The 3-in. ram is securely placed under the bolt to be removed. The screw forces oil in the cylinder against the ram. A small hole is provided near the top of the plunger to prevent its being moved beyond the bore.

CROSSHEAD AND PISTON SEPARATOR.

This separator, Fig. 36, is made on the same principle as the bolt extractor shown in Fig. 35, and is used for separating the crosshead and piston rod. The tool is made of wrought iron, and the machine is shown. The ⅛-in. holes and the space behind the ram are filled with thick oil. The separator is applied to the crosshead in a manner similar to that of placing a connecting rod and the wrist pin is put in place. The wrought iron ram forces the oil against the plunger, which is shown separate and in enlarged scale. The center of the ram engages that of the piston rod, forcing the latter out of the crosshead. This is a very handy tool for both shops and roundhouses.

SPRING PULLER.

Fig. 37 shows a tool which is very useful in rapidly removing broken and replacing new locomotive springs in the roundhouse. Being light, the device is easily handled and

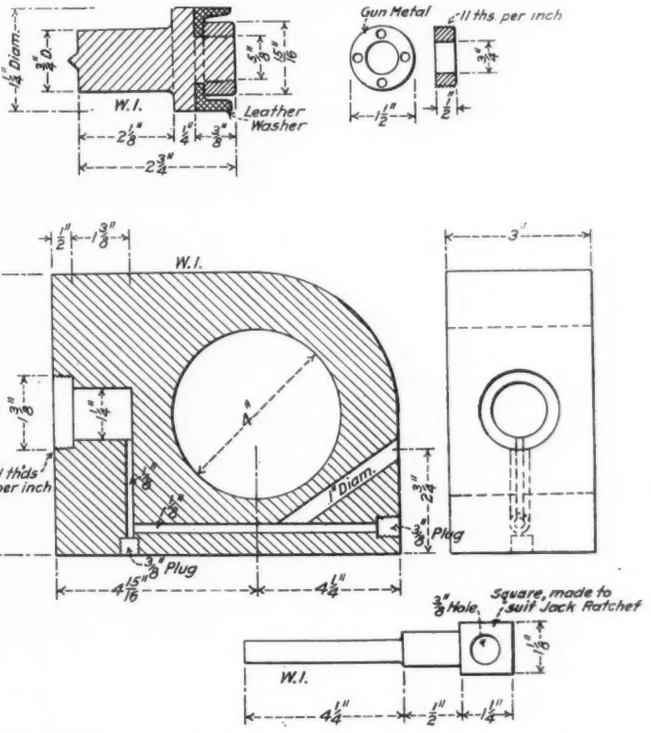


Fig. 36—Crosshead and Piston Separator. Porter.

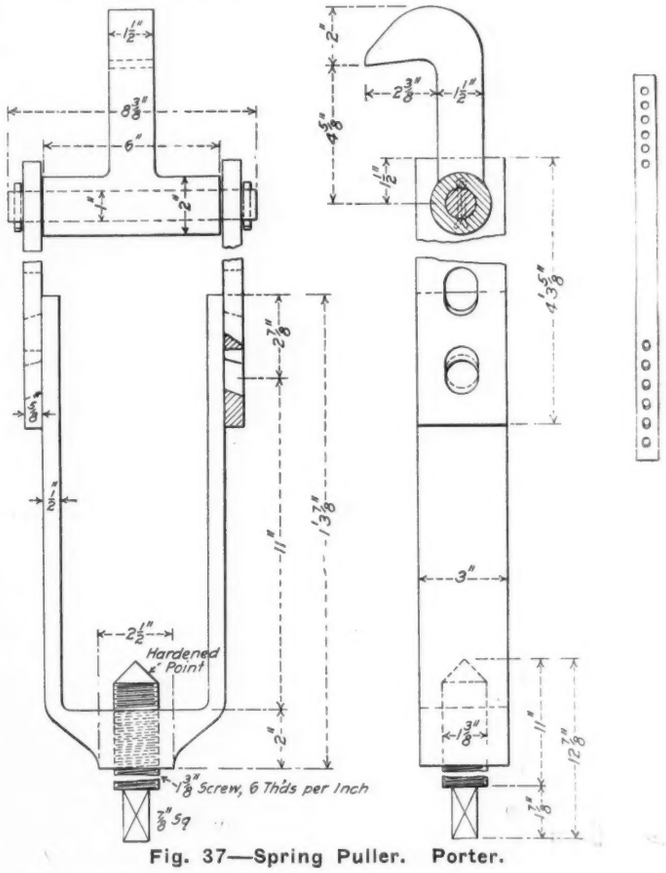


Fig. 37—Spring Puller. Porter.

quickly adjusted. The hardened point bears against the lower rail of the frame, and the hook grips the springs.

SMOKE STACK CRANE.

This crane, shown in Fig. 38, does not differ greatly from

what has become every day practice in the large majority of shops, but at the same time it is a design which should prove very efficient. As it is made of wrought iron it is very light and easily handled. When applied to the stack it may be easily placed in any position.

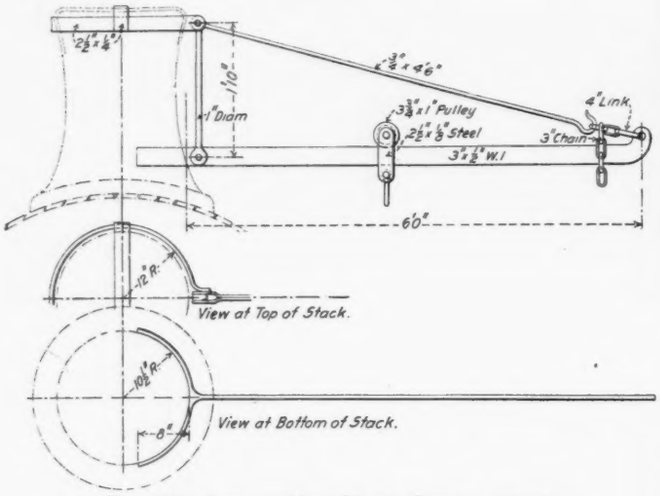


Fig. 38—Locomotive Stack Crane. Porter.

AIR PUMP PISTON HOLDERS.

The air pump piston holders, shown in Fig. 39, are applied to piston heads to prevent their turning when removing the piston rod nuts. The designs are exceedingly simple, steel

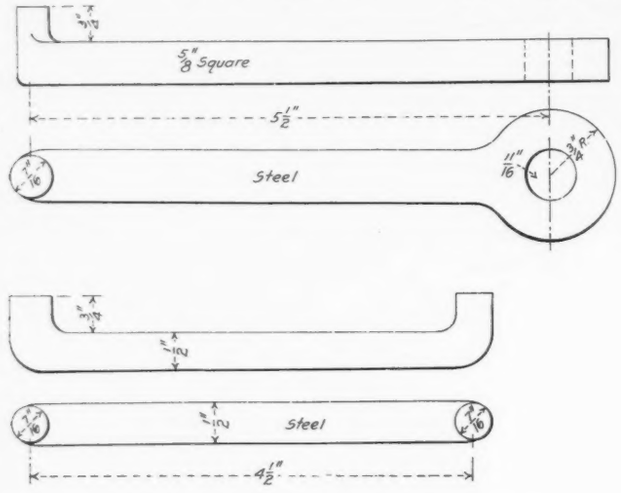


Fig. 39—Air Pump Piston Holders. Porter.

being the metal used. Both are used constantly in the air brake department. All of the tools in this collection are in use in the West Toronto shops of the Canadian Pacific, where they are considered very efficient ones, particularly the bolt extractor and the crosshead and piston separator.

EIGHTEENTH COLLECTION.

BY J. F. PERRITT,
Blacksmith Foreman, Seaboard Air Line, Jacksonville, Fla.

BRAKE HANGER BENDING MACHINE.

The illustrations, Figs. 40, 41 and 42, show a machine for bending brake hangers. The halftone illustrations show the two positions of the machine. The adjustable fingers are set according to the length of hanger required. The complete details are given in the line cut, from which this tool can be made.

HOOK BENDING MACHINE.

The two halftone illustrations, Figs. 43 and 44, show a machine, or tool, for bending hooks, especially for train chains.

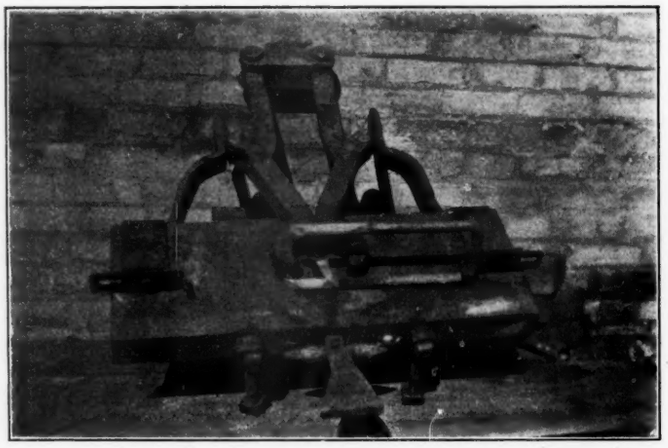


Fig. 40—Brake Hanger Bending Machine. Perritt.

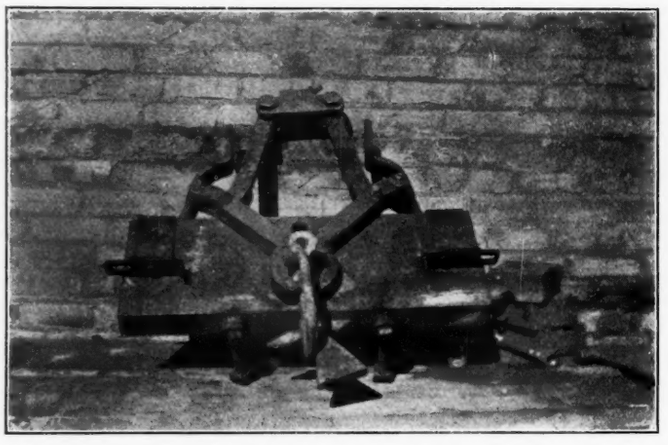


Fig. 41—Brake Hanger Bending Machine. Perritt.

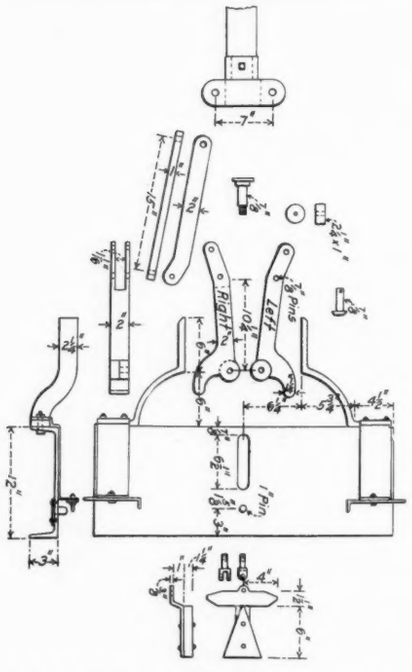


Fig. 42—Brake Hanger Bending Machine. Perritt.

The open position is shown in Fig. 43 and the closed, or forming position in Fig. 44. It will be noticed that the vertically operating hinge has beveled edges. These bevels, when the hinge is closed, provide a mold which gives the proper section to the hook. This same effect is gotten on the outside of the hook by the slot-section of the formers.

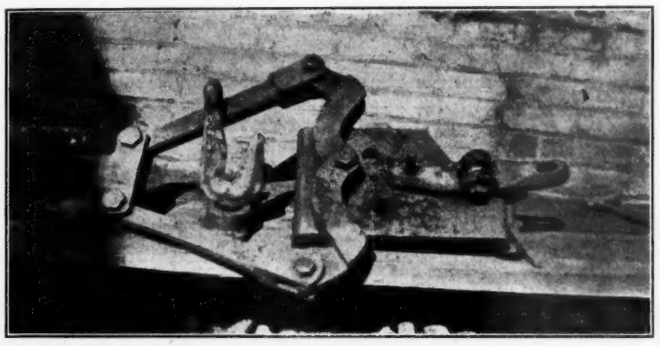


Fig. 43—Hook Bending Machine. Perritt.

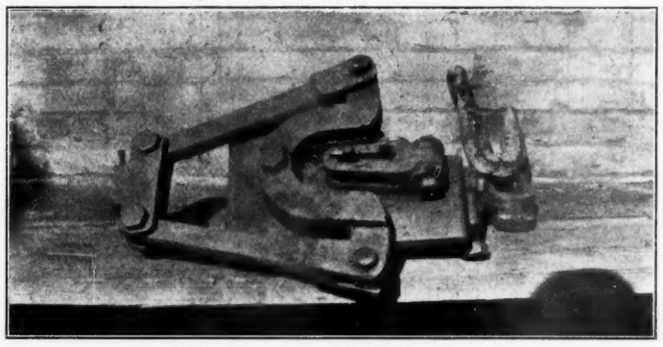


Fig. 44—Hcok Bending Machine. Perritt.

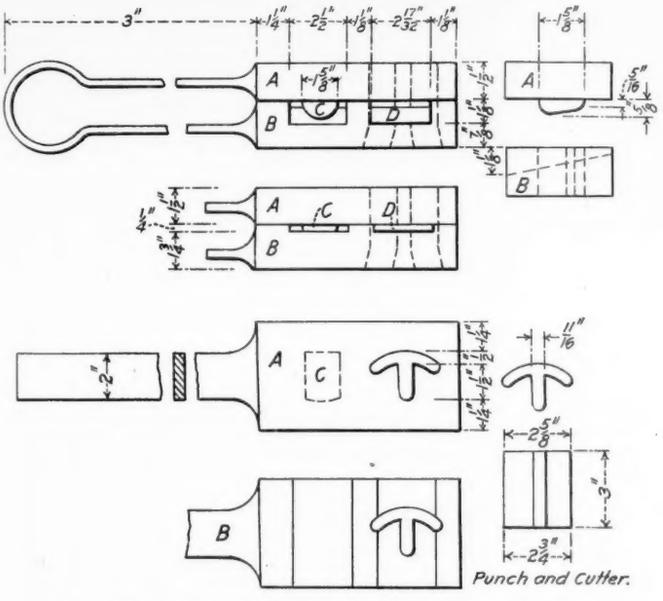


Fig. 45—Steam Hammer Claw Bar Tool. Perritt.

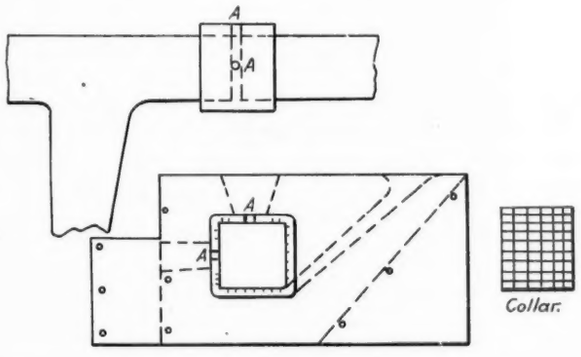


Fig. 46—Wood Collar for Thermit Weld. Perritt.

STEAM HAMMER CLAW BAR TOOL.

Fig. 45 shows a tool for use with a steam hammer. It is made up of male and female dies, to which the spring steel handle is welded. The steel for the claw bar is first drawn to the desired shape, after which it is placed between the dies at C. This form completed, the metal is placed between the dies at D, by which it is punched and cut off.

WOOD COLLAR FOR THERMIT WELD.

The sketch given as Fig. 46 shows a method of using white pine wood, instead of wax, for forming the collar around a locomotive frame when making a Thermit weld. This method is used entirely in the Jacksonville shops of the Seaboard. The wood is not alone much cheaper than the wax which would be required, but the frame is heated in about two-thirds of the time required when wax is used. The interior face of the wood mold is changed to a heated band, which aids in heating the frame. The inside surface of the collar is checked as shown. This reduces its thickness and allows the collar to burn out more quickly. After the mold has been packed and the plugs removed ¾-in. holes are drilled through the collar at the points marked A.

STEAM HAMMER PILE BAND TOOL.

In Fig. 47 are shown, assembled and in detail, a tool for welding pile bands under a steam hammer. The block C rests

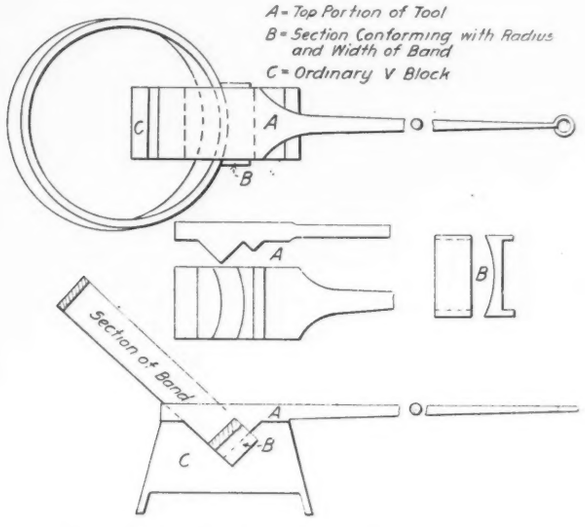


Fig. 47—Steam Hammer Pile Band Tool. Perritt.

upon the anvil of the hammer and the band takes a diagonal position, so that the necessary hammer blows may be struck. The several parts, A, B and C are referred to in wording on the cut.

MISCELLANEOUS KINKS.

LOW TRANSFER TABLE.

A deep pit for a transfer table is usually very much of a nuisance, and this is particularly true where it is necessary to locate it within the walls of the building. A table, by the use of which the depth is reduced to 13 in. below the top of the rail, is shown in the illustration, Fig. 48. The table is formed of I beams, upon which the running rails rest and are used as girders for the table. They are practically suspended from the journals of the carrying wheels. The table has a running width capable of taking two tracks and is also provided with spools for hauling cars. It is braced and held square by diagonal tension braces, as shown, and runs upon six rails, one-half of the table only being shown in the engraving. It would, of course, be possible to fit it with electric motors by an extension of one of the end axles, so as to run the whole length of the machine and placing the

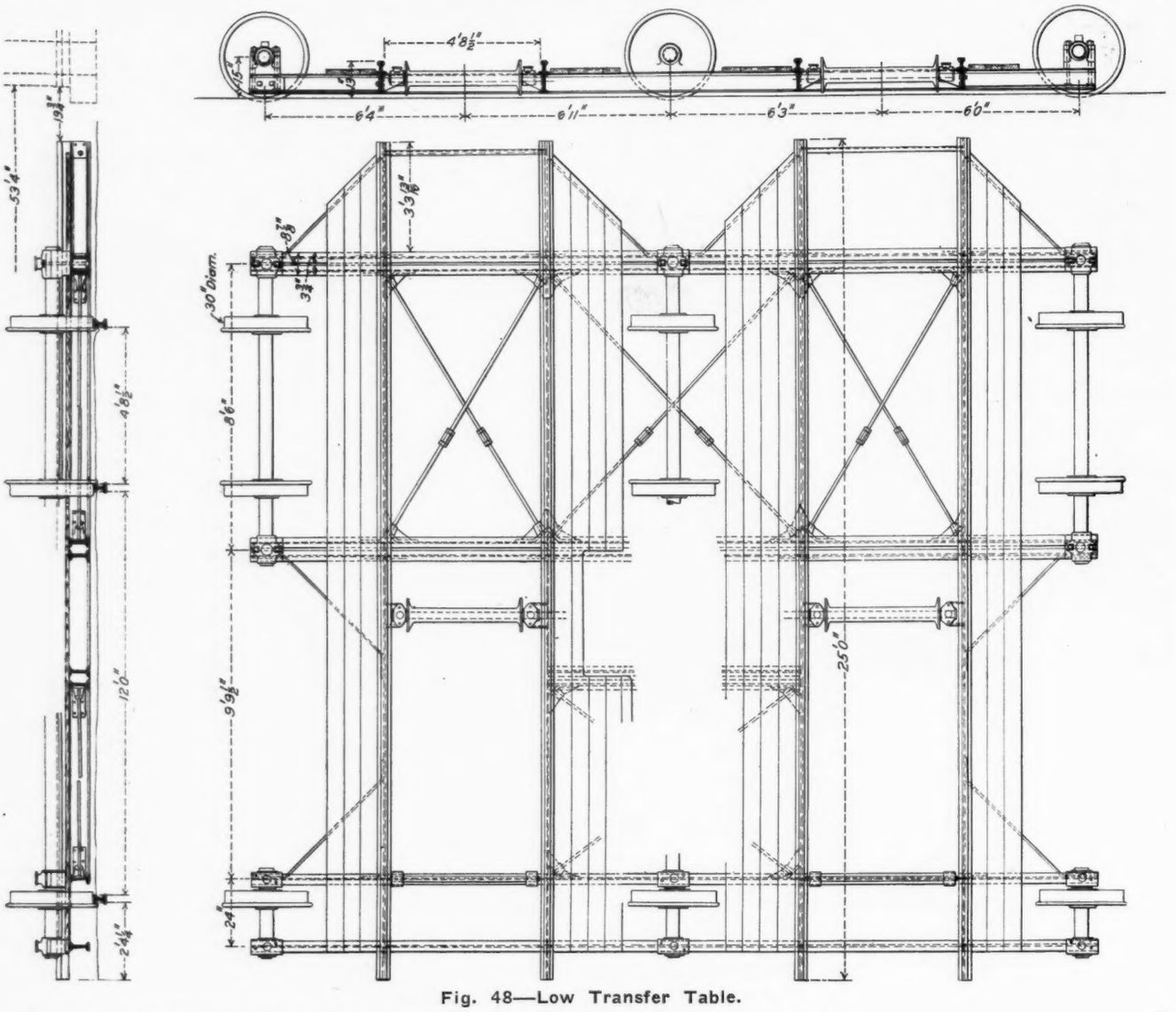


Fig. 48—Low Transfer Table.

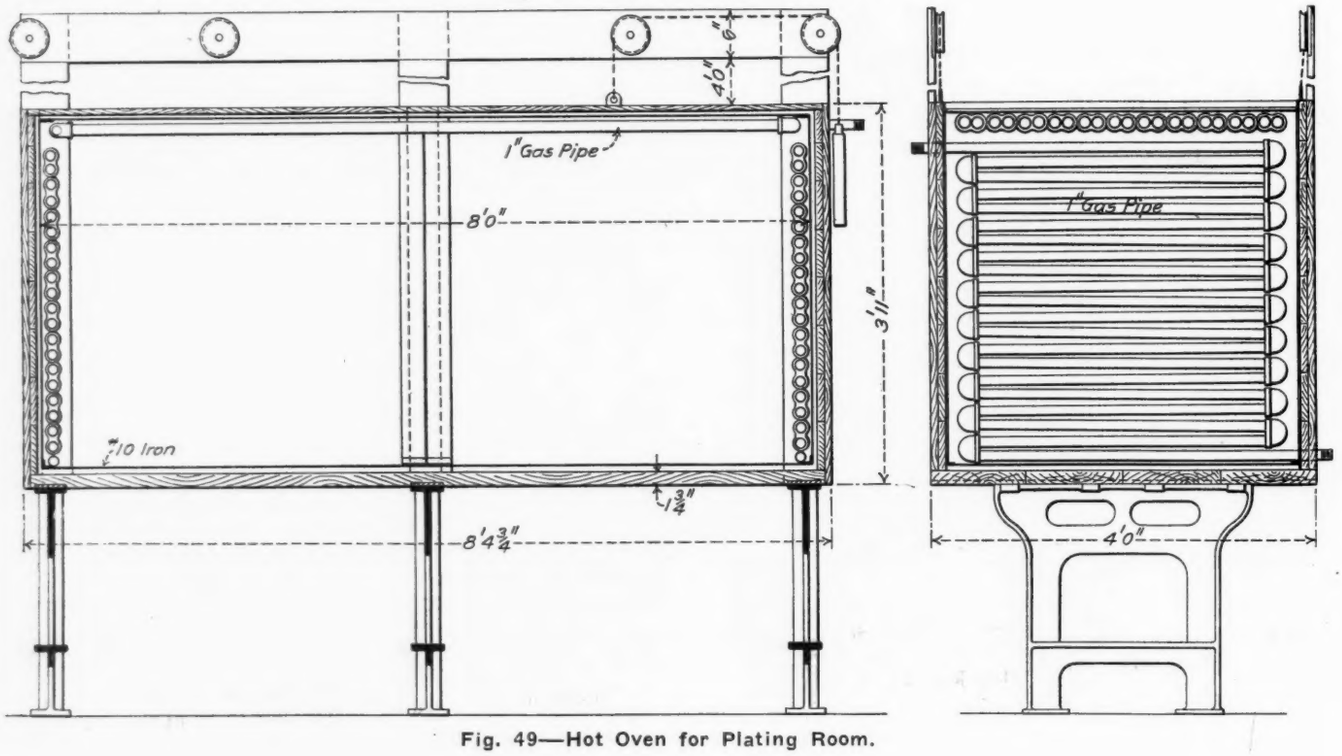


Fig. 49—Hot Oven for Plating Room.

electric drive on a floor at a level with the rails. It is not necessary to use the full width of the table on the double-track, as it is of sufficient strength to hold itself square under ordinary conditions for even the narrow width. The I beams used are 7 in. deep and of average strength.

HOT OVEN FOR PLATING ROOM.

A convenient form of plating room or hot oven, for use in connection with the replating of headlight reflectors and ornamental brass work of cars, is shown, Fig. 49. It is also used for drying lacquer. It consists of three substantial legs of cast iron, supporting a wooden box, lined with 1-in. gas pipe. The wooden box has an inner lining of No. 10 iron, held at the corners by light angles, and with a space ½-in. thick between it and the wood of the box, which is filled with plaster-of-Paris for insulating purposes. The doors at the front are opened by sliding vertically and are counterbalanced by the weights, as shown. The total height of the dryer is 3 ft. 11 in., with a width of 8 ft. 4¾ in.

FROM THE MEADVILLE SHOPS OF THE ERIE.

The following collection of shop kinks were gathered by F. E. Lister, associate editor, *Railway Age Gazette*, from the shops of the Erie, at Meadville, Pa. We are indebted to E. G. Chenoweth, mechanical engineer of the Erie, for courtesies extended in this connection.

STEAM PIPE JOINT RING GRINDER.

Probably one of the most undesirable jobs in overhauling a locomotive is that which has to do with the removing and replacing of steam pipes. The insuring of steam-tight joints between the several sections of the piping is much more important than the work is undesirable. Any tool or device

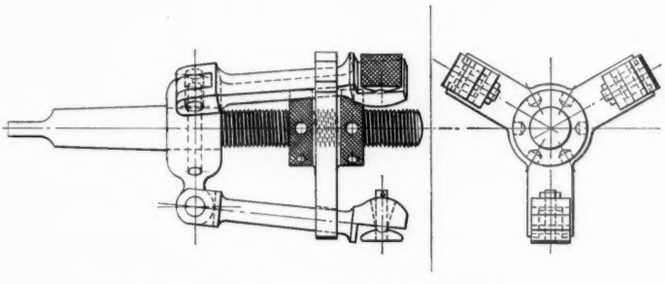


Fig. 50—Steam Pipe Joint Ring Grinder. Erie.

which will assist in grinding the joint ring will be a welcome one in any shop, especially those where a block, shaped like a frustum of a cone, is used. The tool shown, Fig. 50, is intended for use with an air motor, the shank having the standard Morse taper. The tool is seen to be adjustable and the three self-adjusting shoes accommodate themselves to the inner rough surface of the ring. This device is not only adaptable for grinding joints on the sections of the pipe after removing them from the locomotive, but also for those joints which are not easily accessible, such as the one in the flue sheet. The tool is also very advantageous for roundhouse use.

PORTABLE ECCENTRIC KEY SEAT MILLER.

The use of a rough forged tit-drill and chisel for sinking eccentric key seats in driving axles is undoubtedly a time-honored practice and one which may ever continue, especially in roundhouse running repairs. The tool shown, Fig. 51, is designed to greatly facilitate this work. The standard Morse taper shank provides for attaching an air motor directly above the milling cutter. Steel ball races and bearings prevent any loss of power due to friction. The tool is fastened to the axle by means of two chains and tightening screws, which latter bear against the underside of the axle. The V-shaped surfaces of the device provide for bringing the cutter on the center line of the axle. The depth of the key way is governed by

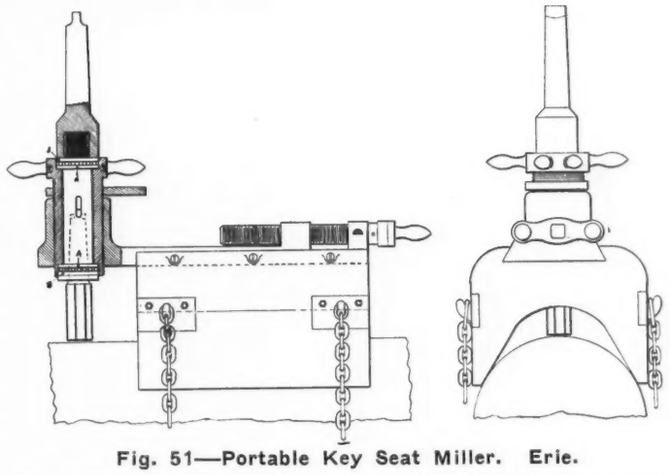


Fig. 51—Portable Key Seat Miller. Erie.

the horizontal star wheels and maintained by setting the lock nut. The feed is governed by the two-spoke wheel at the opposite end of the device. Provision is made in the guides for taking up all possible wear, there being two adjustable gibbs which are adjusted by set screws, shown in the side elevation.

FLUE CUTTER.

The assembled and detailed drawings of the flue cutter, Fig. 52, illustrate what probably is as efficient a tool for this work as is now in use. Removing a set of flues, using an air hammer and chisel to cut loose the rolling at the front flue sheet, not only takes from 15 to 20 hours' time, but it is also a laborious task, as the mechanic is compelled to work in a cramped position, especially in small diameter arches. The

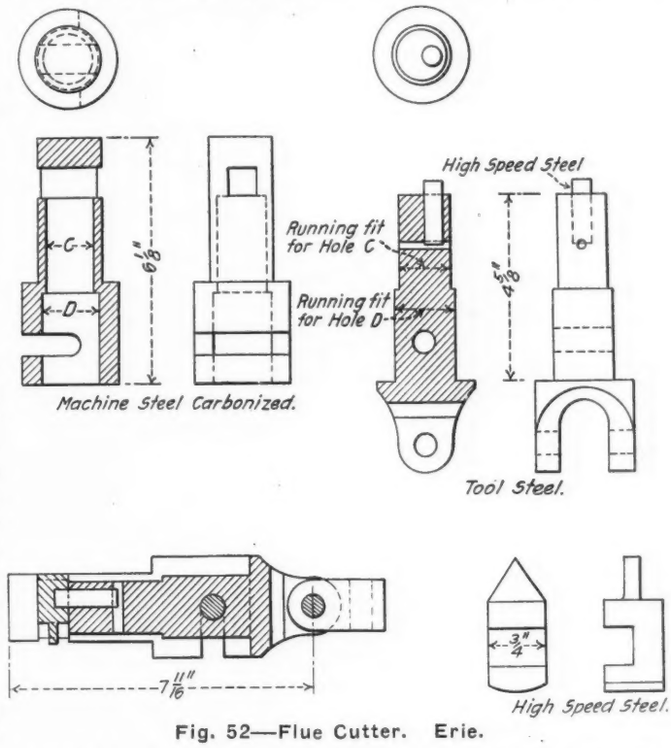


Fig. 52—Flue Cutter. Erie.

simplicity of this tool at once recommends it to the tool maker as well as the user. The outside bushing shaped part is made of carbonized machine steel and the center cylindrical portion is made of tool steel. The second portion carries the tool steel pin, which bears directly against the high-speed steel cutter. Reference to the drawing shows that when the inner cylinder is in its full position toward the left, the eccentric action of the tool steel pin, which engages the cutter, draws the blade inside of the tool diameter, permitting the whole to be inserted in the tube. When power is applied in the

right-hand direction, the eccentric action of the pin forces the cutter out and through the walls of the tube just behind the flue sheet and to complete the circle, taking out a band of metal the width of the blade face. The power is then reversed, which throws the blade back into the tool and permits its withdrawal from the tube for another cut.

This tool is intended for use with an air motor, the toggle permitting a universal joint connection to a bar, one end of which has a Morse taper end for inserting in the motor socket. The air motor is swung in the arch on the center line of the boiler, and the universal joint permits cutting out the entire set of flues without changing the position of the motor. The motor should have a quick reversing valve arrangement, as the tool makes but one revolution in cutting and one in the opposite direction for removing.

The tool foreman at Meadville, John Hessler, who designed and made all of the pneumatic tools here given, is authority for the statement that the tool will cut a set of 326 tubes in five hours, which, with an air hammer and chisel, would take about three times as long.

FLUE EXPANDER.

A very efficient tool for expanding flues, one which is used in all of the shops of the Erie, is shown, Fig. 53. This tool differs from the well-known expander of this general type, in that the three 5/8-in. cold rolled steel rollers are set on an angle of 3½ deg. with the center line of the tool. In using

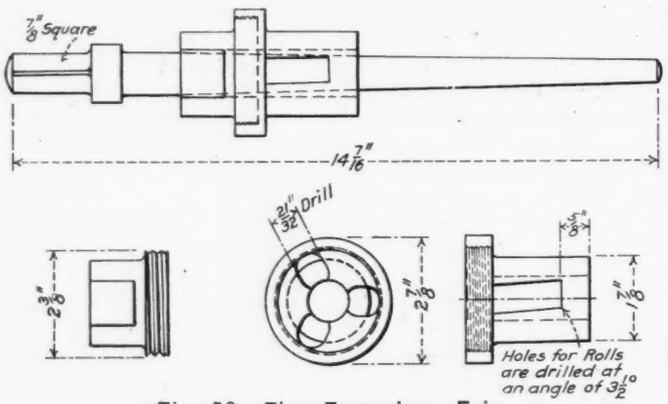


Fig. 53—Flue Expander. Erie.

an expander in which the rolls are set on the center line, it is necessary to expand the rolls by striking the end of the spindle. This not only tends to strain the fibers of the tube metal but makes a more or less uneven roll, and also shortens the life of the spindle by battering its end. With the rolls set on an angle, the feed is automatic, as is also the withdrawal of the tool when revolving the spindle in the left-hand direction.

SOLID OIL CUP UNDER CUTTER.

With the advent of side and main rods having oil cups made integral with the forging, it became necessary to devise a tool for cutting the clearance space at the base of the threads inside the cup. This can be done by using a small cutter on a vertical spindle. In this case, however, it is necessary to have the spindle of a diameter sufficiently small to allow for feeding the tool into the work, with the result that the tool chatters and the cut is generally unsatisfactory. The tool shown, Fig. 54, is one designed to obviate these difficulties.

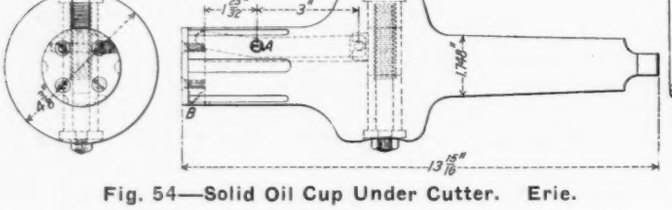


Fig. 54—Solid Oil Cup Under Cutter. Erie.

Its outside diameter is made slightly less than that of the hole drilled for tapping. The cutting edge of the tool is seen at B. The opposite end of the cutter receives the end of the lever which is fulcrumed at A. Power is applied through the square threaded screw to force the cutter outward. The circular plate, fastened by four countersunk screws, holds the cutter within the tool. The six flutes provide for gathering the cutterings. This tool is for use in a drill press, having the standard Morse taper.

TELL-TALE HOLE PUNCHING DIES.

In those shops where solid staybolt iron is used it is necessary to provide for tell-tale holes in the ends of the bolts. These holes are usually drilled after the bolts are riveted up, using an air-driven breast drill. This method is not always satisfactory, as the small diameter drill often breaks off in the hole, thus placing a steel plug which is difficult to remove. The Erie uses solid staybolt iron, but instead of drilling tell-tale holes they are hot punched before the bolt is threaded. This is done in a bulldozer, using the die and punch shown, Fig. 55. Provision is made for 15/16-in., 1-in., 1⅛-in. and 1 3/16-in. iron. The dies are made according to the bulldozer

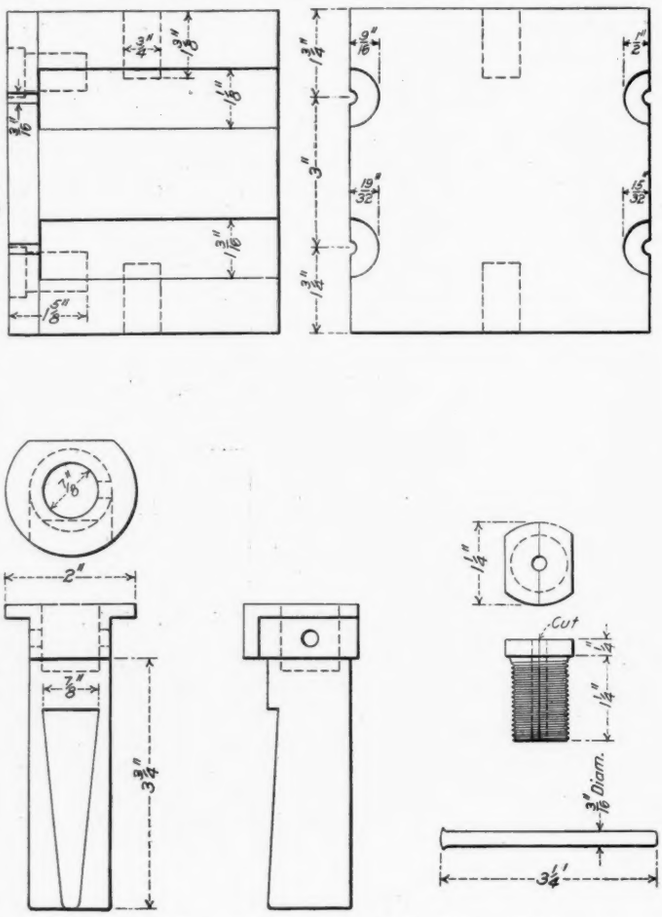


Fig. 55—Tell-Tale Punching Dies. Erie.

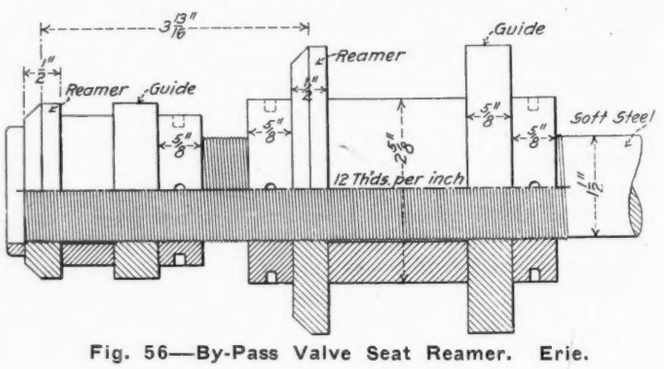


Fig. 56—By-Pass Valve Seat Reamer. Erie.

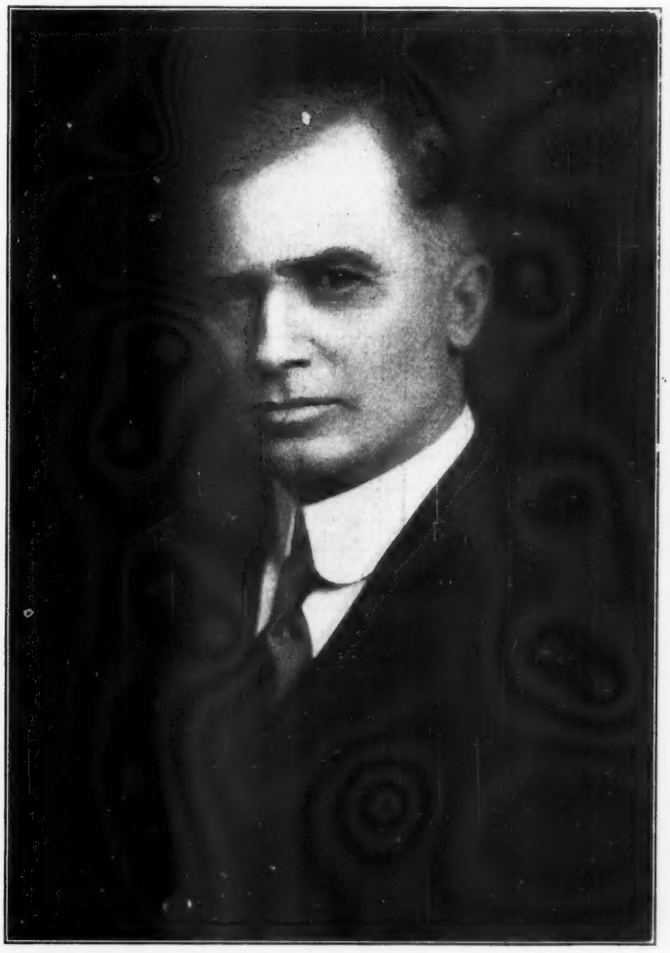
which will receive them. The $\frac{3}{16}$-in. steel pin is inserted in the steel plug, which in turn is screwed into the holder. The hole through the plug is drilled of the same diameter as the pin and the plug is then sawed into halves. This provides for clamping the pin firmly when the plug is screwed in place. The small head on the pin is peened cold, the end being previously annealed. The iron, after being cut into bolt lengths, is heated in a furnace. One blow of the steel pin is sufficient to pierce the required tell-tale hole, and the bolts are threaded after cooling.

BY-PASS VALVE SEAT REAMER.

The sketch herewith, Fig. 56, shows a built-up reamer for trueing up the bevel seats of by-pass valves. The spindle, which receives the cutters, thimbles, guides and nuts, is made of soft steel. The lower end of the spindle has a washer, machined in place, against which the lower cutter rests. The lower guide is separated from the reamer by a distance piece, or thimble, and the three are secured in position by the ring nut which bears against the guide. The upper cutter and guide are similarly clamped in position, there being two ring nuts. These nuts allow for adjustment of the cutters. The tool is designed for use with an air motor, the top of the spindle having a standard Morse taper.

DANIEL WILLARD.

Daniel Willard, vice-president of the Chicago, Burlington & Quincy, the Colorado & Southern and the Colorado Springs & Cripple Creek District Railway, and president of the Colorado Midland, has been elected president of the Baltimore & Ohio, succeeding Oscar G. Murray, who has been elected chairman of the board. Mr. Willard began his railway career at the bottom. He was born in North Hartland, Va., and on Jan. 28, 1910, he will be 49 years old. When he was 18 he began railway work as a track laborer on the Central Vermont. He was later fireman and locomotive engineman on the Passumpsic Railroad, now a part of the Boston & Maine, and on the Lake Shore & Michigan Southern.



Daniel Willard.

He got his real start, however, on the Minneapolis, St. Paul & Sault Ste. Marie. He got work as a brakeman on this road in 1884 and remained in its employ as brakeman, conductor, roundhouse foreman, engineman, trainmaster, assistant superintendent and superintendent of the Wisconsin and the Peninsular divisions until 1899.

While he was on the "Soo" he formed a friendship which has had a strong influence on his subsequent career. This was with Frederick D. Underwood. Like Mr. Willard, Mr. Underwood started at the bottom. In 1886 he had become general manager of the Minneapolis & Pacific, and when this road became a part of the Minneapolis, St. Paul & Sault Ste. Marie he became general manager of the latter property. Meantime, Mr. Willard had come under his observation and had been singled out as especially deserving of confidence. When Underwood went to the Baltimore & Ohio in 1899 as general manager he took Willard with him as assistant general manager, and during the month of May, 1901, Willard was acting general manager. Two years later, when Mr. Underwood became president of the Erie, Mr. Willard went to the Erie with him as assistant to the president. Mr. Willard subsequently became third vice-president and then first vice-president and general manager of the Erie.

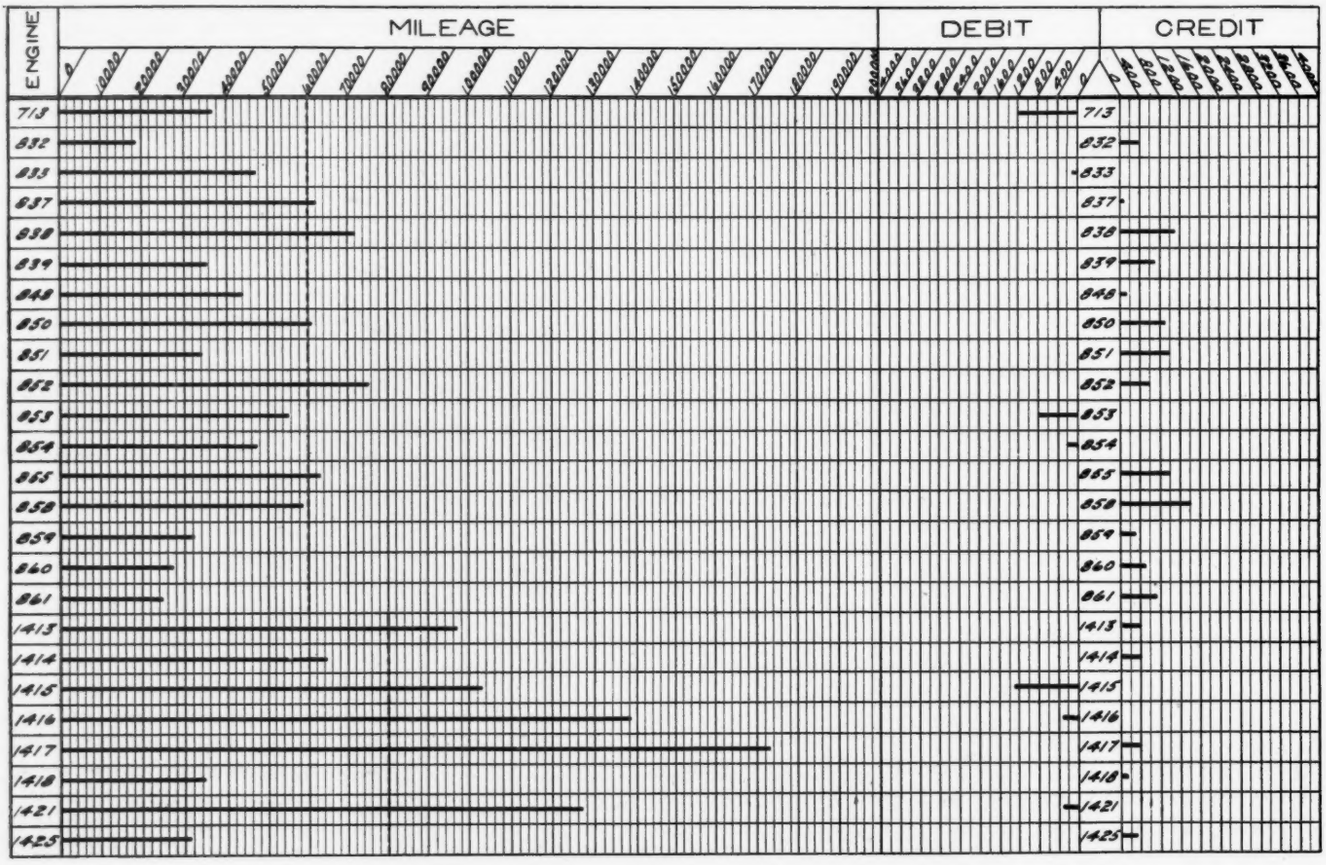
Nature gave Mr. Willard unusual ability and tremendous energy. He is one of the most indefatigable workers in the railway business. He not only works hard, but he works fast. These natural endowments alone would not have put him where he is; but in addition to having ability and energy he has had an extraordinary taste for serious study. He has been a student all his life. Few active business men have read so many books on economic and kindred subjects.

It will be noted that during his railway career he has had experience in the track and the motive power departments as well as in the operating department. This has made him an all-round operating man, and, taken in connection with the large knowledge he has acquired by study, makes him an extraordinarily broad railway executive. One way that Mr. Willard has shown his intelligence and breadth in recent years has been by frankly recognizing that the anti-railway agitation has not been without cause and in choosing means for stopping it. He has welcomed fair and intelligent criticism of the Burlington from every source. He has had newspaper and all other kinds of criticism sent to the general offices in Chicago, and has had the criticized conditions systematically studied with a view either to showing the critics that their complaints were unjustifiable or to removing the grounds for complaints. He has frankly recognized the fact that public sentiment is more powerful than any corporation or number of corporations, and has insisted that the railways should adopt the policy of educating rather than opposing it.

Mr. Willard was elected second vice-president of the Chicago, Burlington & Quincy in January, 1904. Under his administration second track has been nearly completed between Chicago and Omaha, a good deal of second track has been built elsewhere, and various extensions have been made. The cost of improvements has risen as high as $15,000,000 in a year. Mr. Willard was made vice-president of the Colorado & Southern and subsidiary lines and president of the Colorado Midland when the Burlington acquired control of these properties from the Hawley interests. He comes to the Baltimore & Ohio at a time when this company has need of a thoroughly aggressive management to help it meet the competition in the soft coal business. His past record indicates that he is a man likely to give the B. & O. such a management.

LOCOMOTIVE MILEAGE CHART.

The mileage chart given herewith is one which is used in connection with the locomotive mileage allotment system used on the Atchison, Topeka & Santa Fe. The debit and credit columns are not useful on roads which have no allotment system, but the mileage column alone is valuable on any road, as it shows at a glance the mileage expected of each locomotive and also the amount which has been made up to the time of making the report. The vertical dotted line in the upper left hand section of the chart indicates the standard mileage which the freight locomotives given on the chart are supposed to make before being again shopped. The vertical dotted line in the lower left hand section of the chart indicates the mileage for the passenger locomotives listed. The debit and credit columns show the amounts accrued at the time of the report under the allotment system. The various classes of locomotives are allowed a certain fixed amount per mile run towards their next shopping. If running or light repairs absorb more than the allotment in any case the balance is shown on the debit column. We are indebted to C. J. Drury, general road foreman of engines, A. T. & S. F., for the above.



Locomotive Mileage Chart.

LOCOMOTIVE AND CAR REPAIR SHOPS OF THE NEW ORLEANS GREAT NORTHERN AT BOGALUSA, LA.

The shops here illustrated are a good example of modern design and construction adapted to a small road and arranged so as to answer for a locomotive terminal as well as a locomotive repair plant. The New Orleans Great Northern is a new southern railway extending from Jackson, Miss., to New Orleans, La. The road passes through an extensive undeveloped section of pine forests and the present operating mileage is 273 miles, including branches, over which passenger and freight service is being maintained. The general manager is N. G. Pearsall and the chief engineer is J. F. Coleman. The Arnold Company, Chicago, made a study of the conditions and requirements of this line pertaining to locomotive, freight and passenger car repair shops; it was then retained as engineers to prepare plans and specifications for the buildings and equipment and later acted as constructors of the complete plant ready for service.

The construction was taken up in January and completed in June, 1909. The site for the location of the shops at Bogalusa, 70 miles north of New Orleans, was selected for the following reasons: First, its nearness to the center of gravity of the system; second, the prospective development of the new city promising to attract skilled and common labor; third, the large area of level ground adjacent to the main line, affording an ideal place for shop tracks; fourth, convenience and economy of purchasing electric power from the large plant of the Great Southern Lumber Company adjucent to the shop site, thus saving the railway the expense of building a plant of its own; and, fifth, an abundant supply of pure artesian well water and excellent natural drainage.

The shops are not intended to provide for repairs of the railway equipment only, but provision is made for repairing a portion of the special logging machinery of the Great Southern Lumber Company, comprising locomotives, steam log rollers, steam skidding machines and cars. The capacity of the plant with present facilities is sufficient to handle 50 locomotives, 20 geared locomotives, 10 steam logging and skidding machines and 5 Barnhardt steam log rollers, in addition to 3,000 freight cars and 30 passenger cars. There are five main buildings and seven auxiliary structures. By referring to the ground plan it will be seen that the layout is designed to provide for the necessary terminal facilities as well as those for general repairs.

SHOP TRACK SYSTEM.

The yards and buildings are served with a system of standard gage tracks, and each department is laid out to permit of 100 per cent. extension. At present the locomotive and coach shops are approached by a system of ladder tracks, but it is intended to remove these whenever the tracks are extended

and to install a transfer table running between the two buildings. A standard gage track passes through the woodworking shop parallel with the freight car repair tracks and industrial track for timber from the mill to the repair yard. A similar track extends through the locomotive and forge shop, passing the material sheds and scrap yard, thus facilitating the handling of material between these departments. The track directly through the machine shop and engine house passes over the driving wheel drop pit and renders it possible to roll drivers directly from it into the machine shop, where they are taken by an electric telpher hoist directly to the wheel lathes.

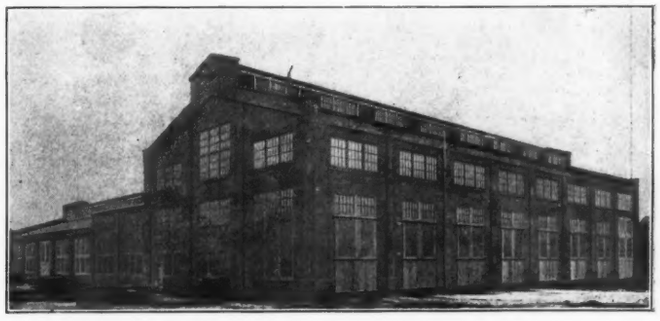
General View of New Orleans Great Northern Shops at Bogalusa, La.

MAIN BUILDINGS.

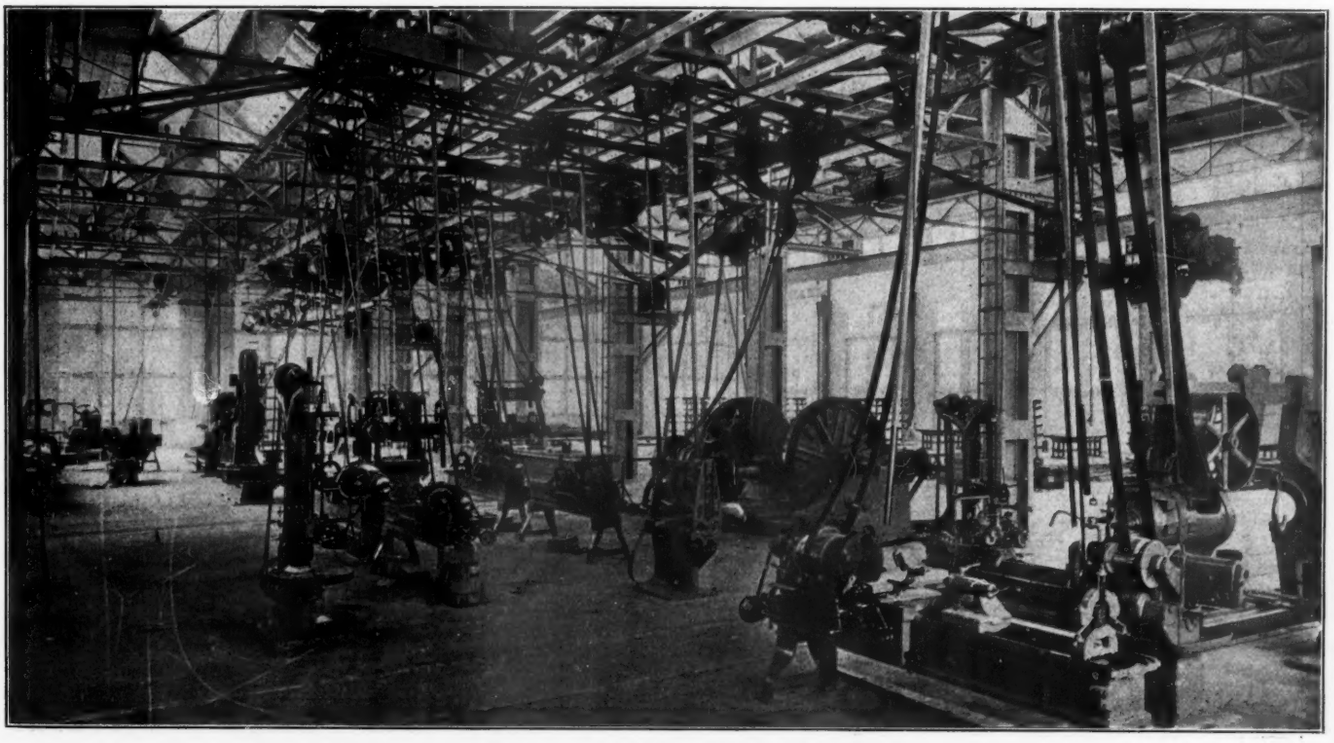
The buildings are constructed from the foundation up of reinforced concrete made from washed creek gravel. An abundant supply of gravel and sand well adapted to concrete construction was obtained from Bogalusa creek, immediately adjacent to the building site. The walls are reinforced with steel bars and they are in general 8 in. thick. The window and door frames were placed in concrete forms and the walls cast around them, thus insuring good anchorage in the joints.

LOCOMOTIVE SHOP.

The locomotive shop is 176 ft. long by 120 ft. wide, with a wing at the west end 66 ft. by 110 ft., which is occupied by the forge shop. The erecting shop has tracks arranged on the transverse system and is 76 ft. wide and 37 ft. high clear under the roof trusses. It has 8 concrete engine pits spaced 22 ft. centers. The machine bay is 44 ft. in width and extends the entire length of the building adjacent to the erecting bay. The roofs of most of the buildings are made of corrugated iron. The floor of the locomotive shops is 3-in. yellow pine laid on 4-in. x 6-in. sleepers embedded in sand. The steel columns are designed to support a future 100-ton crane runway with traveling crane over the erecting bay. For the present needs a 5-ton traveling hoist on a bracket runway is provided on the north side of the bay. Careful attention was given to the natural lighting of the building, and in addition

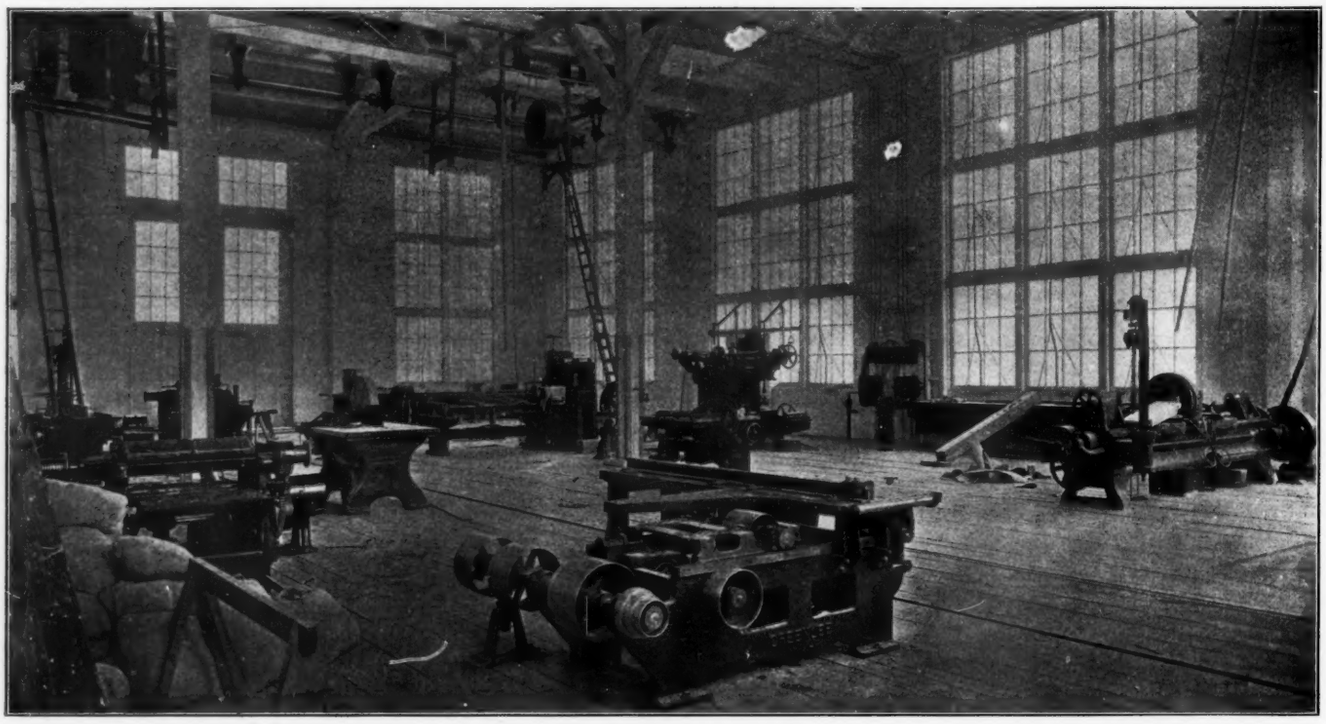


Locomotive Shop at Bogalusa, La.



Machine Floor of Locomotive Shop.

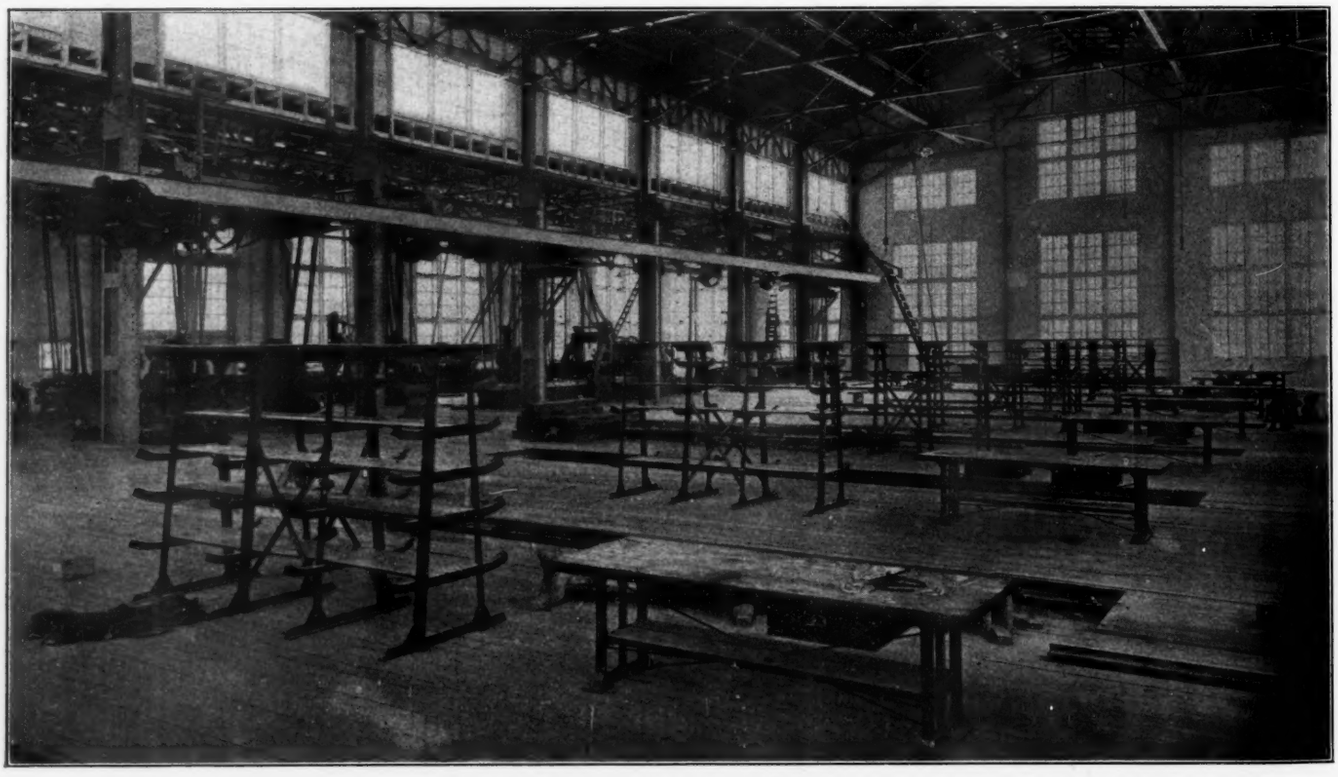
to large side windows and transoms over the track doors, more than one-third the area of the doors is glass. The erecting bay has a large monitor with windows on each side over the entire length, and the machine bay is lighted with three saw-tooth skylights which extend the whole length of the building. On account of the heat and humidity of the climate the windows are designed to provide for all possible ventilation, and are equipped with mechanical operators. The side windows are given an opening of about 30 per cent. of the total area and the monitor windows are arranged for the sash to slide past each other, giving an openin gof about 50 per cent. These windows are moved by a steel cable controlled by a geared operating device.



Machine Floor of Coach Shop.

COACH SHOP.

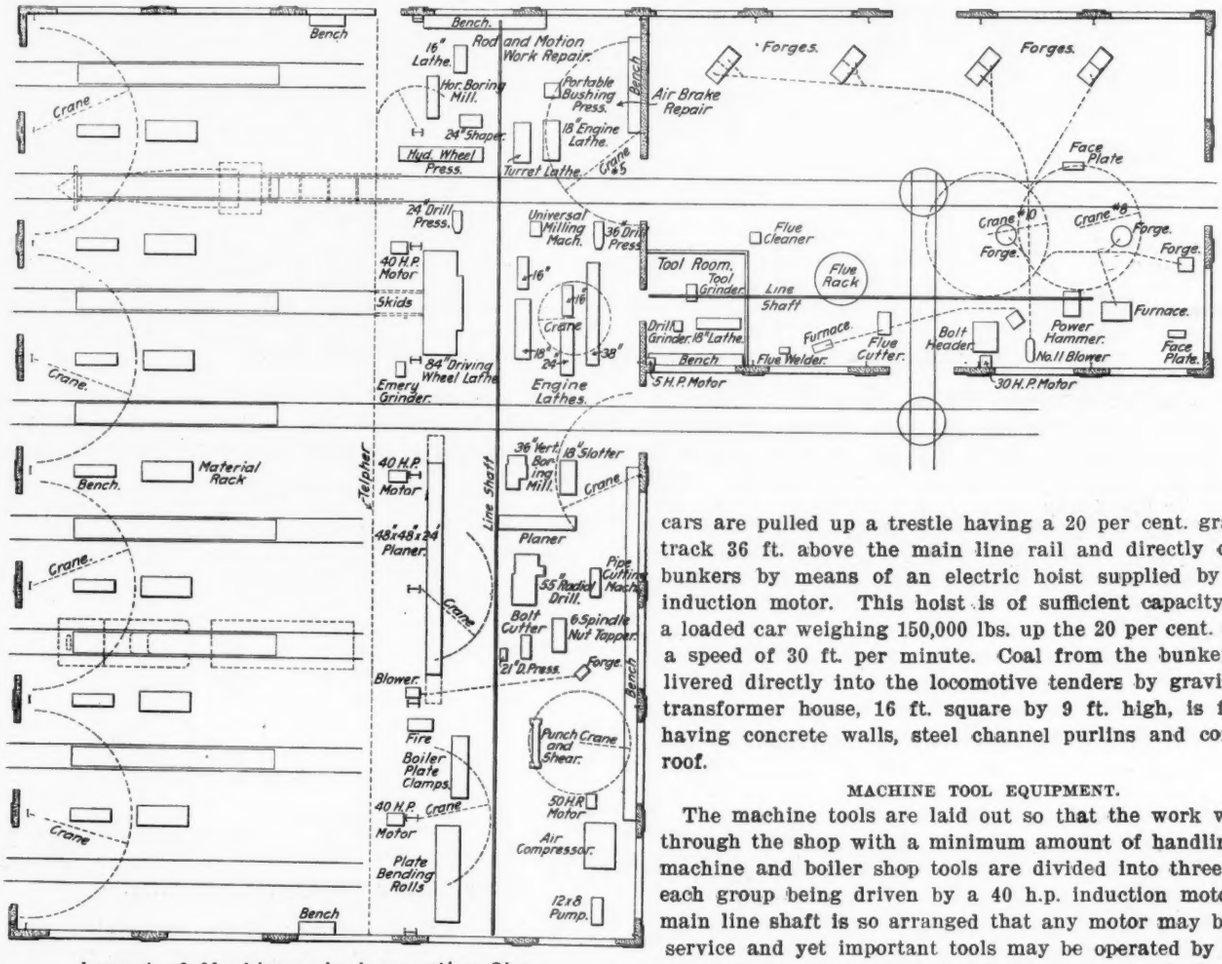
The coach shop is 160 ft. long by 91 ft. wide, having concrete walls and a wide roof framing covered with corrugated iron. The section devoted to woodworking machinery is 50 ft. x 91 ft. and is separated from the coach department by an



Erecting Floor of Locomotive Shop.

8-in. concrete wall, with two double automatic fire doors. At one end a section 20 ft. wide is equipped for brass finishing, upholstering, paint, storage and bench work. The central portion of the building, 90 ft. x 90 ft., is used for coach repairs and painting. The tracks are spaced 20 ft. centers and the floor is of 3-in. yellow pine laid on 4-in. x 6-in. sleepers embedded in sand.

The engine house has two pits connected by a driving wheel drop pit, in which the wheels are handled by a traveling pneumatic jack. The building is of concrete, has wood roof framing and a tar and gravel composition roof. The sheeting for the roof is 2-in. matched yellow pine and the purlins are heavy enough to provide a slow burning type of construction. The smoke jacks are "vitribestos," suspended from the purlins by heavy iron rods painted with asphaltum. The usual track doors on the inner circle of the roundhouse are omitted on account of the warm climate. The storehouse and office building is 121 ft. 4 in. by 60 ft. 4 in. It is reinforced concrete of slow burning wood construction with corrugated iron roof.



Layout of Machinery in Locomotive Shop.

COALING PLANT.

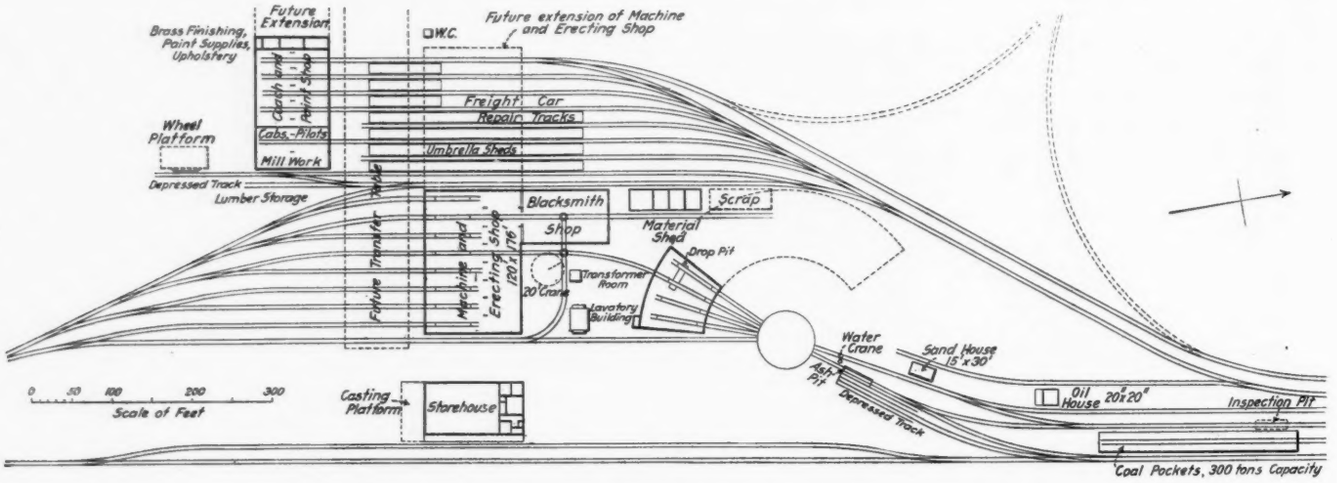
The coal wharf is a wood structure with steel-lined bunkers, having a storage capacity of 300 tons. Standard coal dump cars are pulled up a trestle having a 20 per cent. grade to a track 36 ft. above the main line rail and directly over the bunkers by means of an electric hoist supplied by 40 h.p. induction motor. This hoist is of sufficient capacity to pull a loaded car weighing 150,000 lbs. up the 20 per cent. grade at a speed of 30 ft. per minute. Coal from the bunkers is delivered directly into the locomotive tenders by gravity. The transformer house, 16 ft. square by 9 ft. high, is fireproof, having concrete walls, steel channel purlins and corrugated roof.

MACHINE TOOL EQUIPMENT.

The machine tools are laid out so that the work will pass through the shop with a minimum amount of handling. The machine and boiler shop tools are divided into three groups, each group being driven by a 40 h.p. induction motor. The main line shaft is so arranged that any motor may be out of service and yet important tools may be operated by coupling its tools to adjacent sections driven by other motors. The machinery in the tool room is driven by a 5 h.p. motor, and in case of necessity the tool room shaft can be coupled with that of the forge shop, and these tools driven by that motor. Jib cranes are liberally provided for use in stripping and assembling locomotives, and the heavier machines are likewise

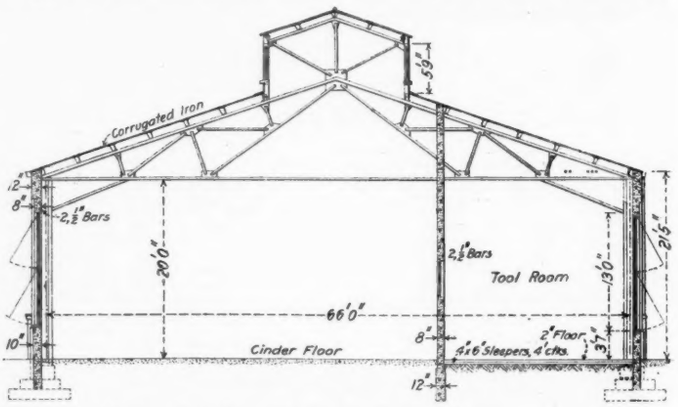
General View, Showing Round House and Station.

served by these cranes, which range in capacity from 1 to 4 tons. They were supplied by the Whiting Foundry Equipment Company, Chicago, and each is fitted with a chain hoist made by the Yale & Towne Mfg. Co., New York. Running lengthwise of the erecting bay and near the machine bay is a floor controlled by a Northern Electric traveling hoist of 5 tons capacity, equipped with 3-phase induction motors. This hoist handles principally the driving wheel work between the various pits and the wheel lathes and serves for general transportation of heavy material. The wheel work is concentrated in one end of the shop, and the tool equipment includes a hydraulic wheel press, a double wheel axle lathe and a car wheel borer, the wheel press being located directly opposite the wheel storage platform located outside, and a depressed wheel track for loading and unloading mounted wheels is located adjacent to the wheel platform. The woodworking machinery is divided into two independent groups, each operated by a 40-h.p. motor. The shafting in this building is supported by 4-in. x 12-in. lattice work struts fastened to the bottom chord of the roof truss. The forge shop tools and blower are driven by a 30-h.p. induction motor. In addition to 11 forges the blower furnishes blast for the furnace used with the power hammer, bolt heater and flues. All blast ducts are laid underground in salt glazed sewer tile. The power hammer furnace and forges are served by two Whiting 4-ton post cranes.

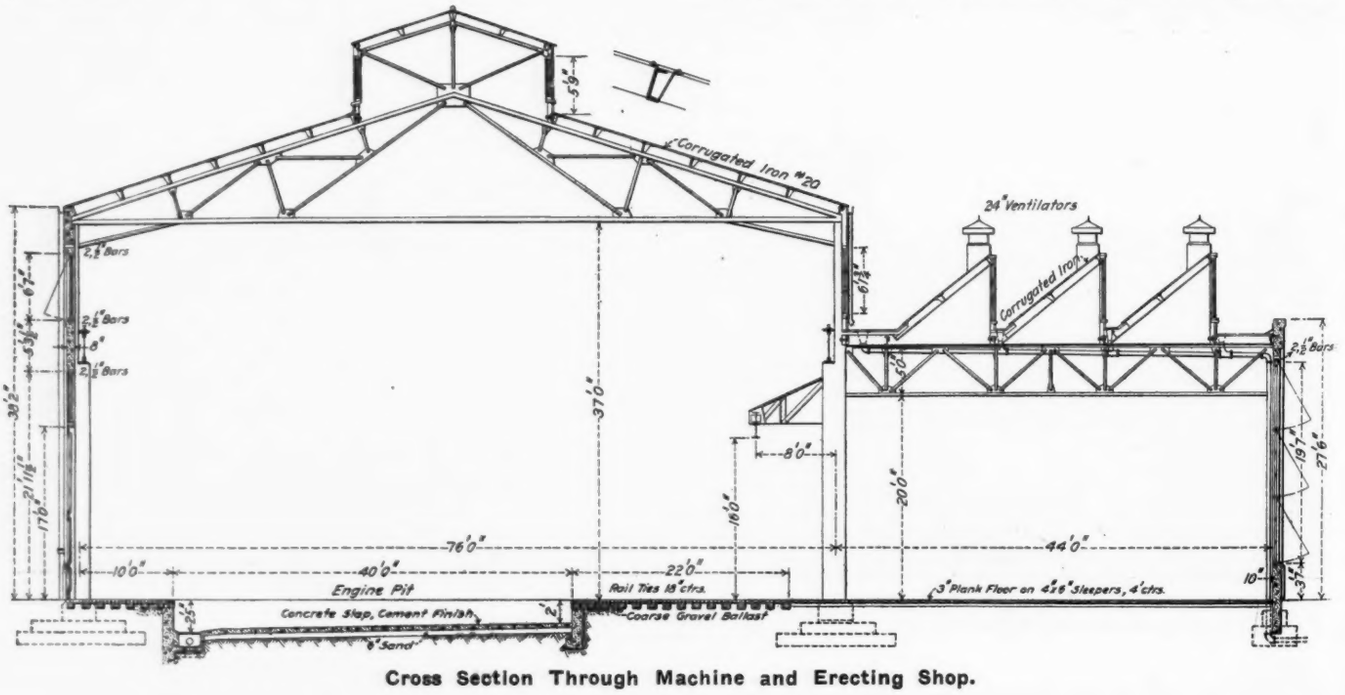


Ground Plan of New Orleans Great Northern Shops at Bogalusa, La.

distant. The current is brought to the shops over a 2,300-volt 3-phase transmission line consisting of three No. 4 bare copper wires carried on wood pins and cross arms on 40-ft. yellow pine poles. The portion of the power plant used by the motors and arc lamps is transformed from 2,300 to 460 volts by means of three 75-k.w. Westinghouse single phase



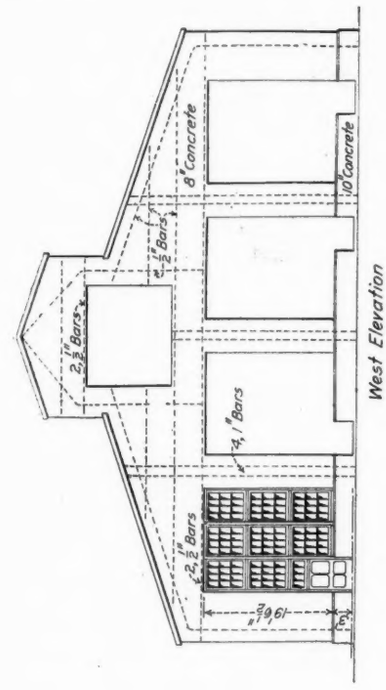
Cross Section Through Forge Shop.

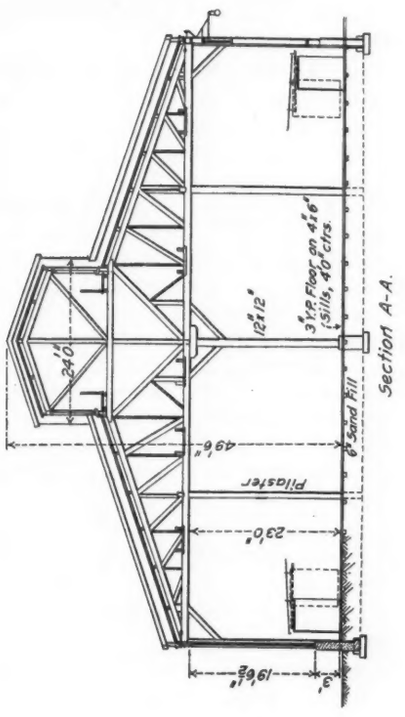


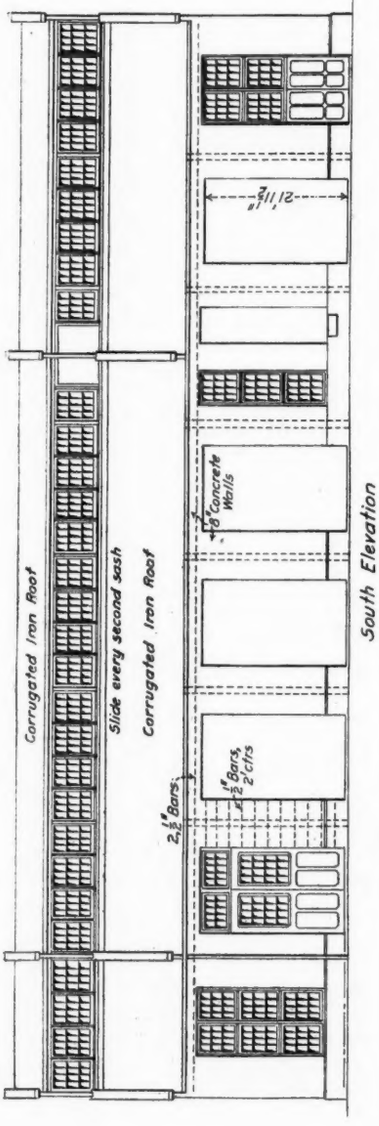
Cross Section Through Machine and Erecting Shop.

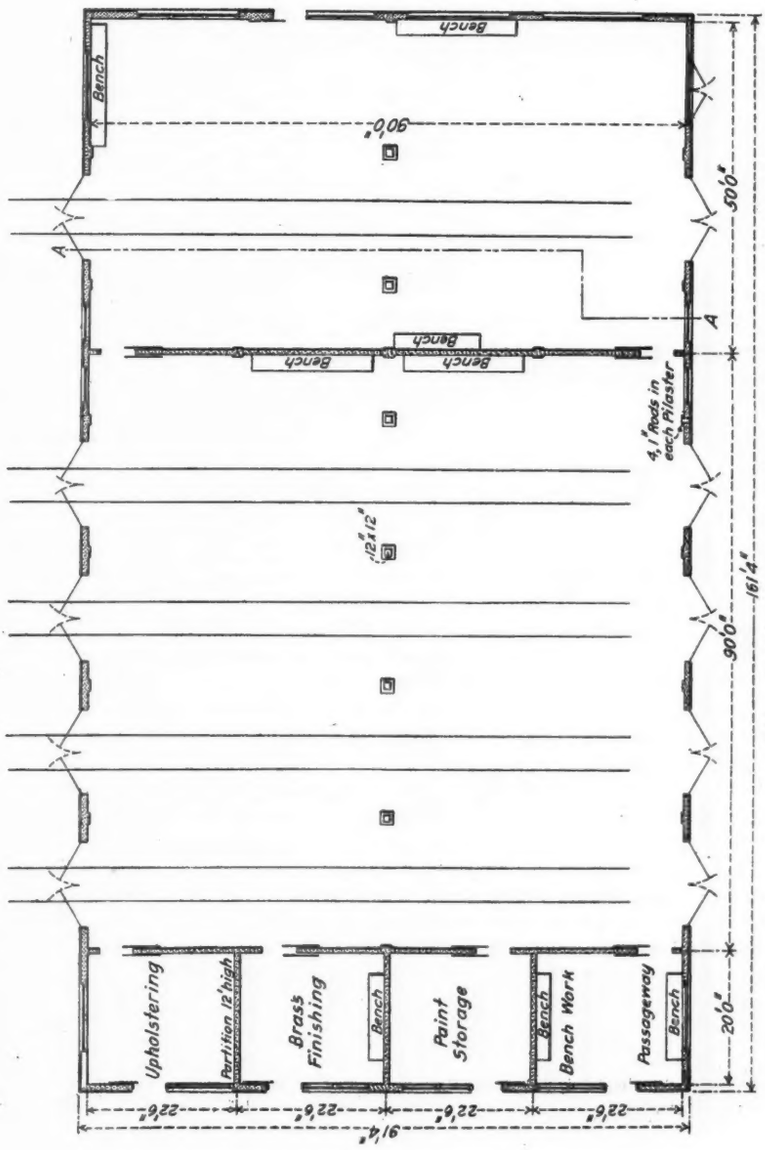
POWER AND LIGHTING SYSTEM.

Electric power is furnished from the Great Southern Lumber Company, whose plant is located about one-half a mile









Plan, Section and Elevation of Coach Shop; New Orleans Great Northern Shops at Bogalusa, La.

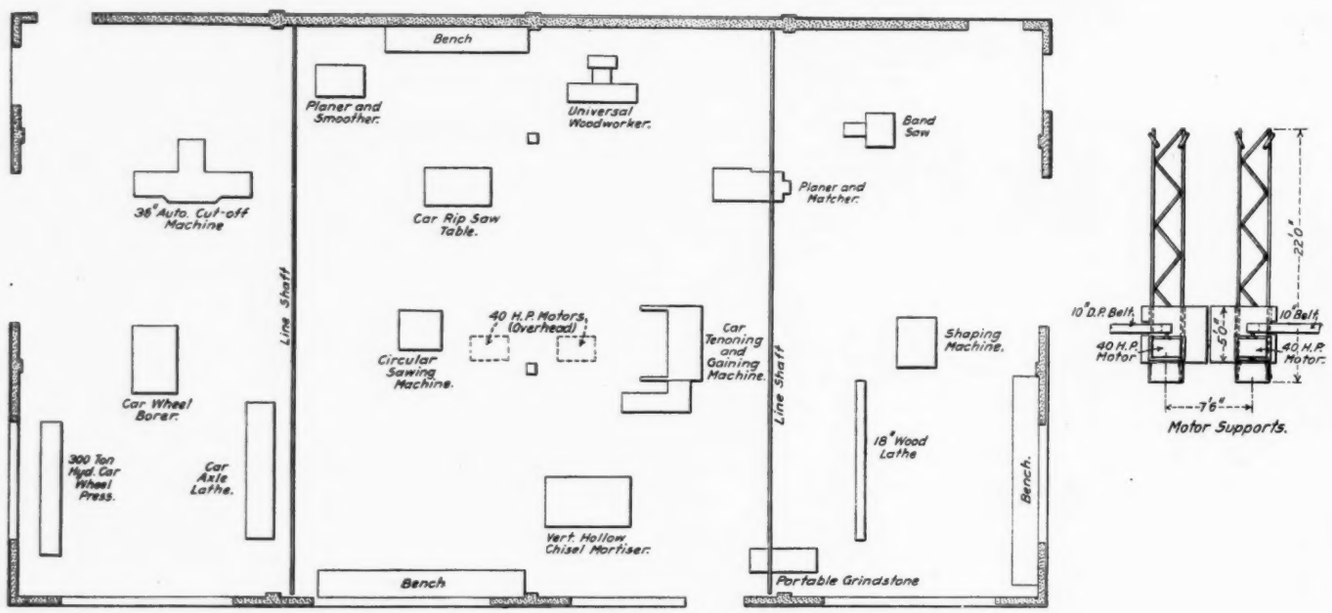
transformers. A 3-phase 2,300-volt — 110-volt transformer provides for the incandescent line.

Allis-Chalmers 3-phase induction motors are used throughout, nine motors being installed at present with an aggregate of 325 h.p. There are 28 Westinghouse 460-volt arc lamps installed throughout the yards and buildings, 14 of these being in the locomotive shop, 3 in the engine house and 11 in the yards. This type of lamp is used because of its convenience in operation on power circuits, thus simplifying the wiring system. There are also installed about the shops about 200 incandescent lamps. Water for shop purposes is piped from the plant of the Great Southern Lumber Company, where fire pumps are installed in connection with an elevated tank. The ordinary pressure on the water service mains is 45 lbs., but this can be increased to 100 lbs. in case of fire. For boiler washing purposes a Deane triplex pump of 325 gal. capacity per minute is placed in the machine shop and it delivers water at 100 lbs. pressure to the hose valves in the engine house.

An Ingersoll-Rand, Chicago, air compressor of 275 cu. ft. capacity, belt-driven directly by a 50-h.p. motor furnishes compressed air for shop purposes.

A rather unusual feature of the shop is the attention which has been given to appearance and harmonizing of the structural scheme with the carefully studied landscaping of the city of Bogalusa. The entire town, including the buildings, is an interesting result of what can be accomplished by a well-directed effort to please the eye without in any way detracting from general utility. The shops with the dark red metal roofs, light gray concrete walls and white window trimmings, surrounded as they are by the deep green of the pine forests, present a very pleasing appearance. The engineering and construction of the complete plant as handled by the Arnold Company was under the general direction of A. R. Kipp, engineer in charge, and H. H. Dickinson, superintendent of construction. P. L. Battey, chief engineer railway shop department, had general supervision over the entire work.

The following is a list of the principal tools installed in the various departments. The arrangement of the tools and equipment is shown in the machinery layout plans:



Layout of Machinery in Coach Shop.

LOCOMOTIVE DEPARTMENT.

Machine Shop:
One 84-in. Niles double driving wheel lathe.
One 38-in. x 16-ft. engine lathe. (Moved from Florinville shop.)
One 24-in. x 16-ft. LeBlond engine lathe.
One 18-in. x 10-ft. LeBlond engine lathe.
Two 16-in. x 8-ft. " " "
One 2-in. x 26-in. Pratt & Whitney turret lathe.
One 42-in. Niles-Bement-Pond vertical boring and turning mill.
One 24-in. Acme crank shaper.
One No. 2 LeBlond universal milling machine.
One 30-in. x 8-ft. planer. (Moved from Florinville shop.)
One 48-in. x 48-in. x 24-ft. Niles-Bement-Pond three-head planer.
One 36-in. Aurora drill press.
One 24-in. Aurora drill press.
One 5-ft. Niles-Bement-Pond semi-universal radial drill.
One 20-in. "D" standard dry grinder.
One 84-in. Niles-Bement-Pond hydraulic wheel press.
One 18-in. Niles-Bement-Pond slotter.
One 23½-in. x 32-in. Niles-Bement-Pond No. 0 horizontal boring mill.
One 16-in. x 5-in. universal turret lathe.
One 35-ton W. & S. portable hydraulic rod bushing press.
One 2-in. bolt cutter. (Moved from Florinville shop.)
One 2-in. Acme 6-spindle nut tapper.
One 21-in. drill press. (Moved from Florinville shop.)
One 225 cu. ft. Ingersoll-Rand Imperial type 10, power-driven air compressor.
One 8 x 10-in. Dean triplex power pump, 225 gallons at 100 lbs. press.
One 48 x 6-in. Niles-Bement-Pond grindstone.
One 3¼-in. x 8-in. Underwood portable cylinder boring bar.
One 26-in. Underwood portable valve seating rotary planer.
One 12-in. Birdsboro-Jackson spiral belt lacing machine.

Boiler and Tank Shop:
One No. 2 Long & Allstatter double punch shear.
One No. 5 (¾-in. x 10-in.) Niles-Bement-Pond plate bending rolls.
One 10-ft. Niles-Bement-Pond plate flanging clamp.
One 4-in. Cox pipe threading and cutting-off machine.
One blower. (Moved from Florinville shop.)

Flue Shop:
One Otto flue cleaner.
One McGrath pneumatic flue welder and scarfer.
One 14-in. x 5-in. Gantt "B" coke furnace for flue welding.
One vertical, revolving, ball bearing flue rack.
One No. 6 Fox flue cutter.

Forge Shop:
One 2-in. Acme bolt heading and forging machine.
One 24-in. x 5-in. Gantt "C" coke furnace for bolt header.
One No. 12 500-lb. Beaudry power hammer.
One 30-in. x 7½-in. Gantt "D" coke furnace for Beaudry hammer.
One No. 11 Buffalo blower. (Moved from Florinville shop.)
One 14-in. x 5-in. Gantt "B" coke furnace for case-hardening.
Two face plates.
Nine railway forges.
Two frame fires.

Tool Room:
One 18-in. Pratt & Whitney improved tool room lathe.
One Yankee (Style "P. O.") twist drill grinder.
One Blount wet tool grinder.

CAR DEPARTMENT.

Car Wheel Shop:
One No. 2 Niles-Bement-Pond double axle lathe.
One 42-in. car wheel borer. (Moved from Florinville shop.)
One 300-ton hydraulic wheel press. (Moved from Florinville shop.)

Wood-Working Shop:
One No. 3 (26-in.) Fay & Egan car rip saw.
One 16-in. Greenlee double arbor universal sawbench.
One 36-in. Greenlee automatic cut-off machine.
One No. 225 Greenlee vertical automatic hollow chisel mortising machine.
One No. 62 Fay & Egan variety wood-worker.
One No. 85 Fay & Egan double spindle shaper.
One No. 108 (15 x 8-in.) Berlin open side moulder.
One No. 5 Greenlee horizontal car tenoning and gaining machine.
One No. 3 Fay & Egan planer and smoother.
One No. 50 (36-in.) Fay & Egan band saw.
One No. 4 (18-in.) Fay & Egan wood lathe.
One 48-in. x 6-in. Niles-Bement-Pond grindstone.
One No. 6A Fox bench wood-trimmer.

General News Section.

Labor leaders in New York City say that no important discussions between themselves and railway officers concerning wages will take place until about January 20.

Officers of the Cleveland, Cincinnati, Chicago & St. Louis, after prolonged conferences with a committee of the telegraphers of the road, have agreed to certain increases of pay.

The Atchison, Topeka & Santa Fe is equipping its freight cabooses with telephones and with "fish poles" for making connection with the line wire along the road at any point.

The Michigan Car Demurrage Bureau, headquarters at Detroit, has been reorganized and now has no direct dealings with the public. The records will be kept the same as before.

In a special election, December 30, the voters of San Francisco decided in favor of an issue of $2,020,000 in bonds to enable the city to operate directly the street railway to Golden Gate Park, which, though owned by the city, has hitherto been leased.

According to Bulletin 105, issued by the census office, the 157 cities in the country which have an estimated population of over 30,000 each, had, two years ago, 17,148 crossings of streets by steam railways, of which 13,718 were at grade. The percentage at grade had fallen slightly since 1905.

The New Jersey State Railroad Commission in making its annual report recommends that the next legislature give the commission jurisdiction over express companies and also pass laws to compel electric and steam railways to establish proper protection at grade crossings where their lines intersect.

The Lehigh Valley, which a week or two since increased the wages of locomotive engineers, has made a new agreement with conductors. According to the newspapers, the principal change is the addition of a clause providing that overtime shall hereafter be paid on the completion of 10 hours' work, instead of 12 hours.

The directors of the Delaware, Lackawanna & Western Coal Co. have declared an initial dividend of 2½ per cent., payable January 15. It is understood that this is a quarterly dividend. The $6,800,000 stock of the coal company was offered to the stockholders of the Delaware, Lackawanna & Western Railroad in July, 1909, at par.

In Baltimore last Friday night one of the shop buildings of the Baltimore & Ohio was damaged by an explosion of dynamite, and at about the same time a bridge was also damaged sufficiently to delay traffic. On the following day five men were arrested. The police connect these outrages with the strike of machinists several months ago.

At Albany, N. Y., December 28, bids were opened for four contracts on the state barge canal. The aggregate of lowest bids, $4,343,474, was less than the aggregate of engineers' estimates. The lowest bidders were the Penn Bridge Company, of Beaver Falls, Pa.; Scott Bros. of Baldwinsville, N. Y., and Shanley-Morrissey, Inc., of New York.

The Boston Elevated Railroad Company distributed in New Year's gifts, to employees having good records for 1909, over $75,000. The number of conductors and motormen employed by this company, including those on both elevated and surface lines, is 3,500. In the past seven years the company has given the employees in this way over $400,000.

The difficulty that railways sometimes experience in meeting public demands is illustrated by the row which is going on in Chicago as a result of an attempt to oust the Illinois Central from its Thirty-first street station. Property owners in this neighborhood got the city council to order the Illinois Central to abandon this station, the technical ground on which the abandonment was required being that the station encroached 10 ft. on city property. Immediately, another faction in the neighborhood began circulating a petition to the city council objecting to the removal of the station. The objectors are mainly working people who say that if the action ordered by the council is taken they will be deprived of reasonable facilities of transportation.

The dispute between the New York, New Haven & Hartford Railroad and the Adams Express Company has been adjusted to the satisfaction of both parties. No details of the settlement are given out. The dispute originated some nine months ago over a claim of the New Haven company, dating back several years, that the division of receipts between the road and the express company had not been fair and just.

Martin S. Decker, president of the National Association of Railway Commissioners, has appointed as delegates to attend the national conference on uniform state legislation of the National Civic Federation in Washington January 17: Chairman Knapp, of the Interstate Commerce Commission; Ira B. Mills, of Minnesota; H. Warner Hill, of Georgia; B. A. Eckhart, of Illinois, and Wm. O. Seymour, of Connecticut. Mr. Decker will attend as a delegate.

S. E. Busser, chief of the reading room department of the Atchison, Topeka & Santa Fe, says that each division headquarters of the company now has a reading room and an auditorium. There are 30 buildings in all. Four concert companies and a number of lecturers are engaged to give entertainments frequently at those division terminals which are situated remote from large towns. The company's reading rooms have 40 billiard tables, 18 pianos and 40,000 books.

The Public Service Corporation, operating street railways in Newark and other cities in northern New Jersey, has voluntarily increased the wages of its conductors and motormen, those who have been in the service more than one year being increased about one cent an hour. Under the new schedule the pay will be as follows: First year, twenty-one cents an hour; second year, twenty-two cents; third year and up to the tenth year, twenty-three cents, when it will become twenty-four cents and be at that figure for all greater terms of service.

The Switchmen in the Northwest.

The time limit fixed by the railways of the Northwest within which such of their striking switchmen as they had positions for could return to work expired on December 29, and the offer which the general managers had made to the strikers was withdrawn on that date. The roads have since been employing additional men to take the places of the strikers. James C. Haynes, mayor of Minneapolis, telegraphed President Taft asking him to intervene in the switchmen's strike, declaring that its continuance was highly injurious to the Northwest and that much loss and suffering have resulted; but Mr. Dickeson, spokesman of the railways, said that the roads had received no complaints of public inconvenience and traffic was normal; and that the telegram to President Taft was evidently prompted by the labor union leaders.

A conference between representatives of the railways and of the striking switchmen in the Northwest, held in the office of Governor A. O. Eberhart, of Minnesota, was reported in our last issue. In this connection a letter sent by the railway officers to Governor Eberhart has some points of interest. This letter recalled that at a conference, held December 23, the roads complied with the Governor's request that they agree to apply in the Northwest the provisions of whatever settlement might be reached by the Chicago roads and their switchmen. Continuing it said:

"With every wish to meet any suggestions made by your Excellency and with the natural desire of employers to help worthy men who gave up their positions and who should be at work for the support of their families and themselves, the representatives of the Twin-City lines submit that no hardship should be imposed nor any injustice permitted to the large number of present employees in yard service who are in no way responsible for the present situation.

"When the former yard employees voluntarily gave up their positions on November 30, after refusing the offer of the railways to arbitrate and be bound by the arbitration award without appeal, it became necessary for the railways to promote many of the men who remained in the service, to transfer some from other branches and to employ many new men in order to perform their duty to the public, to the other employees and to the owners of the properties.

"As large employers of labor under wage agreements, the Twin-City lines would not be justified in reducing in rank these employees who have been promoted since November 30, in returning to their former employment those who have left positions in other branches of the service, or in dismissing without cause the competent men who have been employed to fill the other vacancies.

"It is, however, certain that upon the basis of reemployment suggested by your Excellency many of the old switchmen can be given employment and probably a large number would be restored to their old positions. * * * "

The demand of the switchmen in Chicago territory for advances in wages was formally refused by the general managers' conference committee last week. The railways submitted a counter proposition, the terms of which have not been made public. The answer of the railways was not final, however, and conferences were resumed at Chicago on Monday.

Commissioner E. E. Clark on the Interstate Commerce Commission's Work.*

"Many important and difficult problems arise and demand solution. Frequently they are strongly contested by able men whose views are in direct opposition to each other. Often no decision will be accepted as final except at the hands of the supreme court. The circuit courts of the United States do not agree as to what power the act confers upon the commission. As to some matters we find ourselves in a sort of a 'twilight zone.' We must, however, proceed according to the light we have, and as it is given to us to see, in an earnest effort to find and apply the lawful purposes of the act and to uphold its principles. We perform a legislative and not a judicial function. The judicial branch of the government will not interfere with the legislative unless it shall appear that the legislature has failed to act along lawful lines or that the effect of the legislation is to deprive the carriers of constitutional rights. * * * To my mind the provision for court review of decisions of the commission meant, and still means, review along these lines and no further. * * * It may be thought that the commission is restive under a provision for review of its findings or that it is reaching out for more power because of a desire to exercise that power. The commission earnestly desires and industriously strives to reach full understandings and just conclusions. Its findings must, in the very nature of things, rest primarily upon the facts. If its findings based upon facts are to be reviewed on questions of fact it seems obvious that the commission will be sustained or reversed according to the view taken by the court on questions of fact, upon which differing views can and will be held. * * * We now have a decision of a majority of one circuit court, accompanied by a vigorous dissent, in which it is held that the decisions of the commission are reviewable *de novo*, and a unanimous decision from another circuit court to the effect that the decisions of the commission are reviewable only upon the questions of whether or not the law has been complied with and whether or not constitutional rights have been invaded. The last word on this subject has not yet been said.

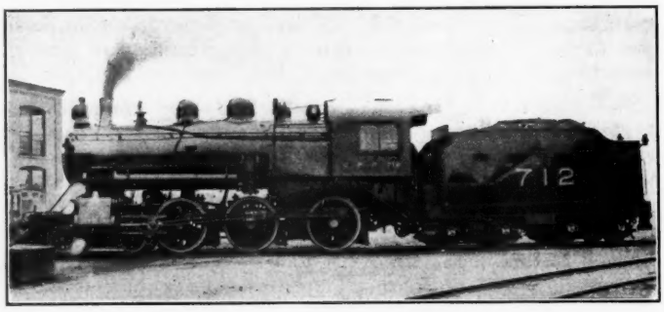
"It is obvious that if the power to determine the relationship of rates as between two localities has not been taken from the railway officials and vested in the commission, under the act which specifically prohibits undue preference for or unjust discrimination against any locality, that power still remains in the hands of the railway officers. If that power is vested in the commission and on the facts it finds that a rate is unduly preferential in favor of one city and unduly discriminatory against another city, and a carrier serves both cities, and those cities are respectively in the jurisdiction of two circuit courts, and those courts review the decision of the commission on questions of fact, and one court sustains and the other court reverses the commission, how will the carrier obey the mandates of both courts? And how can the supreme court decide between them except by trying the matter on the facts? This the supreme court will not, and ought not to, do. If that power is not vested in the commission but still rests in the officers of the carriers what recourse has the locality that is unjustly discriminated against, and where shall it turn for relief from such conditions? The act authorizes the commission, when after full hearing it is of the ojinion that a rate is unreasonable, to prescribe, not a reasonable rate, but what shall be *the* reasonable rate to be thereafter charged as a maximum."

*From an address at a dinner of the Chicago Railway Club December 29.

"Shopping" a Locomotive.

The men of the Canadian Pacific shop force at Winnipeg last month went after a record in the matter of fast work on the general overhauling of a locomotive. They turned over the completed work in 57½ hours elapsed time, despite a heavy handicap in the way of setting up the Vaughan-Horsey superheater with which the locomotive was equipped. The trial was undertaken at the men's own suggestion, no materials being prepared in advance or special preparations made, beyond arranging a minimum time schedule for their guidance. This was beaten in most of the departments by over 50 per cent.

Engine No. 712 was placed in the back shop and stripping down was commenced at 7 a. m. on Monday, October 11. At 4:30 p. m. on Wednesday, October 13, the engine left the shop



Canadian Pacific Locomotive No. 712.

yards on a trial trip and at 7 o'clock the same evening was delivered to the operating department to be taken out on a regular freight run. The engine was of the 4-6-0 freight type, class D-10, and is shown in the accompanying cut. It has cylinders 21 inches in diameter and 28 inches stroke, and weighs 190,000 lbs., the total weight of engine and tender ready for service being 315,000 lbs. The replacing of the Vaughan-Horsey superheater after the tubes were put in and the boiler tested, consumed about ten hours, so that the time would have been shortened by that much had the engine been of the ordinary type, using saturated steam.

There was no scamping of the work and the engine had been on the road for its full mileage before being brought in. All alterations and improvements were made in accordance with regular standards, nothing being neglected. A large amount of new material was machined up and applied, including new tires for the drivers, driving box brasses and liners, shoes and wedges, main and side rod brasses, motion pins and bushes, piston and valve rings, piston head and ashpan. The 244 flues of the boiler and the 22 five-inch tubes of the superheater were removed, and cleaned, and tubes renewed where necessary; new staybolts where needed and all sealing carefully done. A new form of boiler check and bell stand were applied, these necessitating new discharge pipes.

The regular pit gang that carried on the work in the erecting shops on the day shift consisted of nine fitters, two apprentices, five fitters' helpers, four boilermakers, two boilermakers' helpers and three tubers. The night shift consisted of seven fitters, two apprentices, three fitters' helpers, two boilermakers, four boilermakers' helpers and five tubers. Nine strippers were employed on the first half day, and during the progress of repairs five painters, three painters' cleaners, three carpen-

ters, two pilot men, four pipe fitters and four pipe fitters' helpers were employed on the engine during a part of the time.

The work was carried on with regular day and night shifts of nine hours as above, working the prescribed shop hours, except that certain of the more important jobs, such as the application of staybolts, tubes and superheater, were carried on during the meal hours as well. Special crews were not delegated to this particular work. In the fall the C. P. R. shops always work double shifts.

In all about 400 different men charged time against this engine to some extent, including all those employed in the foundry, machine, blacksmith, boiler and tender shops. The charges of the different departments were (cents omitted):

Erecting shop	$448
Machine shop	564
Boiler shop	287
Blacksmith shop	94
Steam fitters	67
Tinsmith shop	1
Tender shop	50
Carpenters	12
Painters	50
Patternmakers	1
Total labor	$1,597
Material	1,078
Total labor and material	$2,675

Telegraph Business.

A Western Union Telegraph official says that the telegraph business was never in a healthier condition. There is a steadiness and volume to it never before experienced at this season of the year. "There is not a single idle wire in our switchboards, and we are unable to supply the demands for private leased wires. In spite of the inroads made on our leased wire service to the brokers by the American Telephone & Telegraph, we have more wires in lease than ever before. What we have lost with the brokers we have more than made up from the press associations and big industrial corporations. The growth of the private wire business is one of the wonders of the development of the telegraph business, and the greatest source of revenue of the telegraph companies. Once a large business concern installs a private wire system it never goes back to the mails and public service again. The public never before received such accurate and fast service. Our instructions are to give the service and never mind the expense."

A Postal Telegraph official says: Our facilities are taxed to their utmost capacity to handle the business. We are extending rapidly in the West and will soon have a new central route to the Pacific coast in addition to our northern and southern routes.—*Wall Street Journal.*

Postmaster General's Annual Report.

The service now has about 325,000 employes, and fourteen billion pieces of mail were handled during the year. The number of post offices in operation is 60,144. A delivery service by carrier is provided in 1,440 cities and towns and there are 40,628 rural routes. The total receipts for the fiscal year 1909 were $203,562,383.07, an increase of 6.31 per cent. over the receipts of the previous year. The total expenditures amounted to $221,004,102.89, an increase of 6.07 per cent.

The loss on second-class mail matter has been increasing for many years, until it now amounts to $64,000,000. The loss from rural delivery, a service begun hardly a dozen years ago and of unprecedented growth, is $28,000,000. By the weighing of 1907 second-class matter was shown to constitute 63 per cent. of all domestic mail, and yet it yielded only about 5 per cent. of the postal revenues. The loss on second-class matter was greater than the profits of all classes of mail combined. It exceeded the total amount paid the railways for mail transportation.

Magazine and other periodical publications exclusive of daily newspapers comprise about 60 per cent. of the second-class mail. The magazines alone form about 20 per cent. The average haul of magazines proper is over 1,000 miles and that of other classes of periodicals, not including daily newspapers, ranges from 550 to over 1,100 miles.

The rural delivery service has developed in twelve years to one of the largest branches of the postal establishment, with an annual expenditure exceeding $35,000,000. The postage on matter mailed on rural routes is estimated at about $7,000,000. The cost of rural delivery is probably much greater than it should be.

The cost of railway transportation during the past fiscal year was nearly $50,000,000.

The department's recommendation for the establishment of postal savings banks is renewed. By limiting deposits and fixing a low rate of interest competition with private banks could be avoided.

To provide a simple and cheap means of transmitting small sums through the mails, and to lessen the use of coins, bills, and postage stamps for that purpose, it is recommended that a form of postal note or check be adopted, similar to the present money order, but issued for lower fees, without written application, in fixed denominations less than $10.

Work on the Panama Railroad.

Some idea of the work that is being done nowadays by Uncle Sam's little 50-mile railway on the isthmus is given by F. W. Fitch, chief despatcher of the Panama Railroad. "On the average we have 450 trainloads of dirt to move in a day. The usual haul is 15 to 20 miles. The Culebra cut furnishes the greater part of it, and this goes to Balboa, formerly La Boca, where they are making a breakwater about five miles out at sea. The Bas Obispo rock goes to the Gatun dam.

"Of commercial freight we handle an average of 6,000 tons a day southbound and 1,000 northbound. The passenger service is immense. There are six passenger trains each way a day, and the usual train carries three first and five second class coaches crowded. The Panamans are great travelers, and the Jamaica negroes spend Sundays and holidays traveling back and forth. Last Fourth of July we carried 45,000 passengers, all free. The number of tourists down there is large, especially Europeans, who seem to take more interest in the canal than do the Americans."—*New York Sun.*

The Transandine Railway.

At the 22d annual meeting of the Argentine Transandine Railway Company, Ltd., in London last week the chairman summarized the progress of the work: "It was in 1874 that Messrs. Clark obtained a concession for two railways, one from Buenos Ayres, to the foot of the Andes, and the other from Mendoza to the limit of Argentine frontier. In 1878 the definite contract was signed. This company was incorporated in 1886. It then had a capital of £700,000, with power to borrow up to £691,000. They started building at once, and in 1888 the first train ran across the important bridge 24 kilometres out of Mendoza—the bridge across the River Mendoza. From that time construction continued steadily, until in 1891 the first 91½ kilometres were opened, and the extra few kilometres at Rio Blanco were completed in 1892. After that, owing to financial and other difficulties, construction was suspended, and it remained in abeyance from 1893 to 1899. At that time the work was recommenced, and went on steadily until we got close to the neighborhood of the Summit Tunnel, when it was no use pressing on with the work, in view of the fact that the Chilian end of the tunnel was not then being built. In 1906 the Chilian side was energetically taken up, and we then entered into an agreement with the Chilian Transandine Construction Company to build our own portion of the tunnel as well as theirs. It was on the 27th of November that we had a telegram to say that the heading of the tunnel was through.—Philadelphia News Bureau.

American Society of Mechanical Engineers.

The New York monthly meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies' building on January 11. A paper on Efficiency Tests of Lubricating Oils by Prof. F. H. Sibley, of the University of Alabama, will be presented and the subject will be discussed by Dr. C. F. Mabery and Gen. Charles Miller. F. R. Low, I. E. Moultrop, J. P. Sparrow and others will also speak.

Meetings of the society will be held in St. Louis January 15 and in Boston January 21. Atlantic City has been selected as the place for the spring meeting, and it will be held from

May 31 to June 3, headquarters at the Marlboro-Blenheim.

The meeting in Boston Jan. 21 will take the form of a banquet at the Hotel Somerset, to be tendered jointly by the American Society of Mechanical Engineers, the Boston Society of Civil Engineers and the Boston branch of the American Institute of Electrical Engineers, to the presidents of the three societies, George Westinghouse, Geo. B. Francis and L. B. Stillwell and other guests, including J. A. Bensel, the incoming president of the American Society of Civil Engineers. A paper will be presented on the main and auxiliary machinery of the battleship North Dakota, illustrated by lantern slides.

American Society of Civil Engineers.

At the meeting held on January 5 a paper entitled "Notes on the Replacing of the Superstructure of the Harlem Ship Canal Bridge," by Horace J. Howe, M. Am. Soc. C. E., was presented for discussion and illustrated with lantern slides.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; May 10-13; Indianapolis.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa. June, 1910; Niagara Falls, Ont.

American Assoc. of Local Freight Agents' Assn's.—G. W. Dennison, Penna. Co., Toledo, Ohio.

American Institute of Electrical Engineers.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 18: New York.

American Railway Bridge and Building Association.—S. F. Patterson, B. & M., Concord, N. H.

American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago, March 14-17, 1910; Chicago.

American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.

American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22; Atlantic City.

American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia.

American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 39th St., N. Y.; 2d Tues. in month: New York.

American Street and Interurban Railway Association.—B. V. Swenson, 29 W. 39th St., New York.

Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.

Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan.; May; Nashville, Tenn.

Association of Railway Telegraph Superintendents.—P. W. Drew, Wisconsin Central Ry., Chicago; May 16-20, 1910; Los Angeles.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Place, N. Y.

Buffalo Transportation Club.—J. M. Sells, Buffalo.

Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.

Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.; irregular, usually weekly; Montreal.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.

Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.

International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York.

International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago; May; Chicago.

International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; May; Cincinnati.

Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.

Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.

New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.

New York Railroad Club.—H. D. Vought, 95 Liberty St., New York.; 3d Friday in month, except June, July and August; New York.

North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.

Railway Club of Pittsburgh.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.

Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.

Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio; May 16-18; St. Louis.

Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.

Society of Railway Financial Officers.—C. Norquist, Chicago.

Southern Association of Car Service Officers.—J. H. O'Donnell, Bogalusa, La.

Southern and Southwestern Ry. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., April, Aug. and Nov.; Atlanta.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R. R. R., East Buffalo, N. Y.

Western Canada Railway Club.—W. H. Rosevear, 199 Chestnut St., Winnipeg; 2d Monday, except June, July and August; Winnipeg.

Western Railway Club.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.

Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

The New York Central Lines announce that from January 31 an excess fare of $1 will be charged from Cincinnati to New York on the train leaving Cincinnati at noon.

The number of passengers arriving in New York during the year 1909 by the principal trans-Atlantic steamship lines was 1,247,244, and the number leaving New York by the same lines was 482,756.

The Pennsylvania is again sending through freight from the Pittsburg to the Middle divisions by way of Hollidaysburg, indicating a heavy movement of eastbound freight. The reopening of the Hollidaysburg classification yards marks the restoration of business to the high level attained in 1907.

Through Southern Pacific passenger trains began running between San Francisco and Seattle on January 2 under the trackage arrangements with the Northern Pacific and other roads which have been already mentioned. The first train run through was the "Shasta Limited," and its scheduled time was 34 hours.

According to a press despatch from London the North Atlantic Steamship lines have agreed on freight tariffs, and the severe competition, resulting in unprofitable rates, which has been going on for a long time, is expected to be stopped. It is said that the cutting of rates arose in the first place in connection with rates to interior points in the United States.

There is one place where the car shortage is now pronounced and constant; that is at Detroit among the automobile manufacturers. That city makes so many of these vehicles that the railways find it impossible to keep up the supply of large cars needed. Fortunately, most of these automobiles are not "necessaries of life" and one's sympathies may still be reserved for other sufferers from "car famine"—such as the coal dealers who did not think to order their supplies before the snow came. Again, the automobile can propel itself, if it is not too proud.

In the 1909 season 12,803 vessels passed through the United States canal at Sault Ste. Marie and 6,401 through the Canadian canal, making a total of 19,204. The total net tonnage of freight through both canals eastbound was 46,379,086 tons, and westbound 11,516,063 tons, making a total of 57,895,149 tons, of which 30,132,374 tons passed through the United States canal and 27,762,775 tons passed through the Canadian canal. In the season of 1908 a total of 41,390,557 tons passed through the two canals, so that the increase in 1909 over the previous year amounted to 40 per cent.

The Hudson & Manhattan Railroad carried, in the month of December, 4,053,586 passengers, which is 52 per cent. more than the number carried in August, when the last line was opened. The line of this company, all tunnels, extends from Twenty-third street and Sixth avenue, Manhattan, south to Morton street; thence across the Hudson river; thence from a junction north to the Lackawanna station at Hoboken, and south to the Erie and the Pennsylvania stations at Jersey City; and thence east across the river to Church street, Manhattan. Of the rooms in the mammoth terminal buildings at Church street, about four-fifths are rented, and it is estimated that the company will earn the interest on its bonds for the current year.

Paul Carbon, a labor contractor and saloon keeper at St. Paul, Minn., and A. Tascas, a labor contractor at Grand Forks, N. D., have been arrested at the instance of the Great Northern on a charge of having defrauded this road out of $200,000 through the sale of trip passes. It is said that other arrests may follow. The method by which these alleged frauds are said to have been perpetrated is as follows: Requisition was made on the Great Northern headquarters at St. Paul for transportation for laborers who, it was represented, were to work on the road's right-of-way. When the transportation was obtained it was sold to the laborers who then were sent to points on the main line of the Great Northern to work for other persons. When they wanted to return to St. Paul transportation was again obtained from the road

which also was sold to the laborers. It is said that there was collusion by employees of the road.

Officers of the Southern Pacific in California continue to report gratifying results from the collection of demurrage on freight cars in that state at the rate of six dollars a day, in accordance with the law passed a year ago. In most cases this sum is more than the car is worth to the consignee as a storehouse, and that, of course gives him an immediate incentive to take his freight away promptly. The "reciprocal demurrage" feature of the law has not made much stir as yet. Possibly this is not strange, for, with the $6 rate for delays in unloading, all kinds of cars have been released so promptly that the railways have, thus far, had no difficulty in meeting shippers' demands promptly. Again, the shipper who wishes to claim the $5 a day penalty from the railway for neglect is obliged to accompany his order for cars with a deposit of one-fourth of the freight charges on the goods that he proposes to ship, and few have taken the trouble to do this. The Southern Pacific has had but three claims for recovery of penalty by shippers.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 61-A, giving a summary of car shortages and surpluses by groups from August 19, 1908, to December 22, 1909, says:

"The surplus shows an increase of 884, bringing the total up 58,354. The shortage totals 24,054, an increase of 5,461 over last report. Both the surplus and shortage figures denote a brisk demand for box and coal cars. The surplus box decreased 2,705, with increases in the box shortage of 3,234. The coal car surplus shows an increase of 365 and the shortage an increase of 2,635."

The accompanying table gives the surpluses and shortage for the period covered by the report, and the chart shows surpluses and shortages in 1907, 1908 and 1909.

CAR SURPLUSES AND SHORTAGES, AUGUST 19, 1908, TO DECEMBER 22, 1909.

	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
December 22, 1909	177	24,284	7,595	7,213	19,262	58,354	10,947	1,021	8,562	3,524	24,054
December 10, 1909	176	26,989	6,488	6,848	17,145	57,470	7,713	757	5,927	4,196	18,593
November 24, 1909	163	17,538	4,091	5,628	12,271	39,528	12,230	891	9,542	4,833	27,496
October 27, 1909	174	13,029	3,090	5,287	9,490	30,896	23,138	1,412	8,743	3,343	36,636
September 29, 1909	174	22,330	3,821	11,239	15,998	53,388	8,184	655	4,392	1,351	14,582
August 18, 1909	169	82,505	5,953	42,158	28,808	159,424	556	277	1,076	100	2,009
July 21, 1909	165	116,221	9,971	78,675	38,487	243,354	106	169	31	33	339
June 23, 1909	166	121,441	12,099	89,292	40,112	262,944	211	190	193	233	827
May 26, 1909	158	118,077	14,940	97,006	43,687	273,710	83	99	1,011	47	1,240
April 28, 1909	161	107,665	16,487	110,538	47,638	282,328	144	106	74	173	497
March 31, 1909	158	101,344	20,428	128,546	46,282	296,600	158	98	116	27	399
February 17, 1909	159	98,512	23,924	135,208	43,797	301,441	266	97	11	96	470
January 20, 1909	162	127,204	26,723	116,680	41,057	311,664	163	21	139	35	358
December 23, 1908	158	87,350	16,247	79,595	38,885	222,077	471	42	289	217	1,019
November 25, 1908	160	45,194	12,157	43,854	31,624	132,829	7,923	178	900	209	9,210
October 28, 1908	158	39,383	10,185	31,541	29,803	110,912	8,175	167	2,261	236	10,839
September 30, 1908	160	42,593	10,365	49,795	31,039	133,792	7,313	450	224	127	8,114
August 19, 1908	160	106,367	13,494	92,500	40,642	253,003	465	90	105	194	854

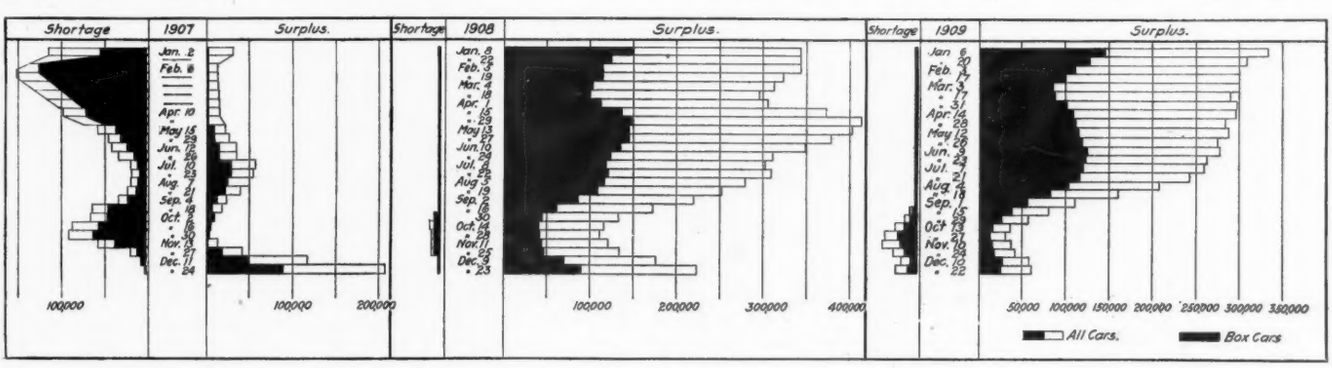
Freight Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association, in presenting statistical bulletin No. 58, covering car balance and performance for June, 1909, says:

"The average number of idle cars during June was 270,252, or 12.62 per cent. of the total cars reported, while the shop cars averaged 7.73 per cent. The averages covering performance, after the elimination of surplus cars, are as follows:

	Average miles per day. Inc. surp. cars.	Exc. surp. cars.	Average ton-miles per car per day. Inc. surp. cars.	Exc. surp. cars.	Average earnings per car per day. Inc. surp. cars.	Exc. surp. cars.
December, 1907.	21.9	23.9	289	316	$1.98	$2.17
January, 1908.	20.8	24.9	277	325	1.81	2.17
February, 1908.	19.7	23.8	271	328	1.82	2.20
March, 1908...	21.2	25.5	290	348	1.95	2.34
April, 1908....	19.6	24.5	258	324	1.83	2.29
May, 1908.....	19.3	24.8	254	329	1.72	2.22
June, 1908 ...	19.6	24.7	276	347	1.88	2.37
July, 1908.....	20.0	24.8	275	342	1.84	2.26
August, 1908..	20.8	25.1	292	354	1.98	2.40
September, 1908	22.0	25.2	320	367	2.24	2.57
October, 1908..	23.8	25.9	346	376	2.33	2.54
November, 1908	23.5	25.8	341	375	2.32	2.55
December, 1908	22.3	25.2	332	376	2.16	2.45
January, 1909.	20.9	25.3	293	354	1.98	2.39
February, 1909	21.7	25.9	306	365	2.04	2.43
March, 1909 ..	22.7	27.2	330	393	2.19	2.61
April, 1909.....	22.4	26.8	310	371	2.13	2.54
May, 1909.....	22.5	26.8	304	362	2.05	2.45
June, 1909....	22.4	26.5	314	371	2.13	2.52

"While the miles per day show a slight decrease, this is more than made up in the ton miles per car day and the daily earnings of all cars on line. This is explained by the improvement in the load per car, which increased from 20.0 in May to 20.7 in June. The per cent. of cars at home increased from 74 in May to 75 in June, with no change in the per cent. of



Car Surpluses and Shortages in 1907, 1908, and 1909.

CAR BALANCE AND PERFORMANCE IN JUNE, 1909.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Oklahoma, Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	75,152	667,852	258,872	132,029	175,137	375,649	16,528	131,498	26,582	116,792	98,511	2,074,602
Average number system cars on line	55,583	484,104	202,070	94,981	132,772	305,215	7,527	100,436	16,497	66,657	82,730	1,548,577
Railroad-owned cars: Av. foreign in line	25,021	164,222	59,176	22,953	31,151	79,444	11,504	29,486	16,530	44,208	15,584	499,279
Total cars on line	80,609	648,326	261,246	117,934	163,923	384,659	19,031	129,922	33,027	110,865	98,314	2,047,856
Excess	5,457	.....	2,374	.....	.....	9,010	2,503	.....	6,445	.....	.....	.....
Per cent. cars on line to total owned:												
Home	74	72	78	72	76	81	45	76	62	57	84	75
Foreign	33	25	23	17	18	21	70	23	62	38	16	24
All railroads	107	97	101	89	94	102	115	99	124	95	100	99
Private cars on line	3,311	38,055	8,906	2,668	6,831	12,909	1,102	6,093	2,143	7,786	3,227	93,091
Total, all cars on line	83,920	686,381	270,152	120,602	170,754	397,568	20,193	136,015	35,170	118,651	101,541	2,140,947
Per cent. of cars in shop	6.49	6.83	6.86	9.05	8.66	6.82	4.53	16.00	6.27	6.48	11.52	7.73
No. of freight engines owned	1,111	9,999	3,686	2,219	2,551	6,262	446	2,508	722	2,356	2,111	33,971
Av. cars on line per freight engine owned	76	69	73	54	67	63	45	54	49	50	48	63
Total freight-car mileage	41,592,750	464,025,022	168,822,354	83,349,486	105,667,631	265,416,142	21,680,374	84,211,555	25,953,423	102,231,458	70,202,536	1,433,152,731
Average miles per car per day	16.6	22.5	20.8	23.0	20.6	22.4	35.8	21.6	23.7	28.7	23.0	22.4
Per cent. loaded mileage	72.0	65.5	64.6	64.2	67.5	71.3	77.4	67.3	67.2	70.7	73.6	67.8
Ton-miles of freight, inc. Co. freight	422,379,129	6,983,602,109	2,511,276,130	1,086,978,674	1,334,748,837	2,084,537,963	330,107,731	1,113,489,135	298,027,219	1,431,010,718	872,056,339	18,468,215,984
Average ton-miles, including Co. freight:												
Per car-mile	10.2	15.1	15.8	13.0	12.7	12.8	15.7	13.2	11.5	14.0	12.4	14.0
Per loaded car-mile	14.1	23.0	24.5	20.3	17.5	18.2	20.2	19.7	17.1	19.8	16.8	20.7
Per car per day	168	339	344	300	263	274	580	286	282	402	286	314
Gross freight earnings	$5,189,845	$42,674,598	$14,173,461	$7,416,918	$8,969,482	$18,720,696	$2,765,393	$9,297,454	$2,565,634	$13,298,180	$6,220,146	$131,291,807
Average daily earnings: Per car owned	$2.30	$2.13	$1.83	$1.87	$1.72	$2.13	$5.58	$2.36	$3.22	$3.80	$2.10	$2.20
Per railroad-owned car on line	2.15	2.20	1.81	2.10	1.84	2.10	4.84	2.39	2.59	4.00	2.11	2.23
All cars on line	2.07	2.08	1.75	2.05	1.77	2.01	4.56	2.28	2.43	3.74	2.04	2.13

loaded mileage, which remained at 67.8. As noted above, there was a slight decrease in the shop car percentage."

The accompanying table shows freight car balance and performance in June.

INTERSTATE COMMERCE COMMISSION.

The commission cannot permit a refund applicable to a particular shipment for the sole purpose of enabling carriers to make good a rate not in effect when the shipment moved, but which they had agreed to protect. Such a practice would do away with the published tariff altogether if generally applied. (17 I. C. C., 333.)

A carrier voluntarily establishing a through rate less than the sum of the locals after a shipment has moved does not, *ipso facto*, become liable for the difference between the amount charged and the amount which would have been collected if the through rate had been in effect at the time of the movement. (17 I. C. C., 295.)

A carload rate and minimum weight, specified in a published tariff as applicable to a car of stated size, constitute a definite offer to the shipping public to move the commodity on those terms, and when a shipper has ordered a car of that capacity the commission will not sanction the imposition on him of additional transportation charges on a shipment that could have been loaded into such a car when the carrier for its own convenience furnishes him a larger car. (17 I. C. C., 209.)

Delay in Repayment of Overcharges Criticized.

Tyson & Jones Buggy Co. v. Aberdeen & Asheboro et al. Opinion by Commissioner Harlan.

Complaint of an overcharge dismissed, the defendants having refunded the amount, but only after formal complaint had been made and copies served on them.

From shippers in all parts of the country, and from local traffic associations which are making earnest efforts on fair and reasonable lines to secure a reform in the practices of carriers in this regard, many complaints have been received during the past year of the inattention of carriers to plain overcharge claims and of their delay in adjusting them. And a survey of these complaints has led us to the conclusion that this practice, or rather lack of practice, among carriers is open to severe criticism.

A substantial portion of the time and labor of the commission is given to the effort to secure, through informal correspondence, the settlement of claims of this character, and it is a burden from which we ought to be relieved by carriers. On the other hand, from the shippers' point of view, nothing in connection with transportation is more vexing and irritating than the labor and delay incident to the following up of an overcharge claim and securing its repayment. When an undercharge occurs it is promptly discovered by the accounting departments of carriers when revising the billing, and demand is at once made on the shipper for payment. With equal facility overcharges are also detected by accounting officers. But from the complaints that reach us it seems to be the duty of no one in the interior organization of many carriers to see that the amount is refunded to the shipper. And when an overcharge is detected by a shipper himself, he is able in the great majority of cases, if we may form conclusions from the numerous complaints now before us, to secure its repayment only after his patience has been sorely tried by the effort and delay required in order to secure serious attention to his demand.

Without wishing to be understood as expressing the view that this loose practice with respect to overcharge claims is characteristic of all interstate carriers, it is nevertheless so common as to justify some attention by the commission. Apparently it is not understood as fully as it should be, by railway officials charged with the adjustment of such matters, that the retention by a carrier of an overcharge not only has all the effects of an unjust discrimination against the shipper from whom the excess has been demanded, but leaves the transportation transaction in an unlawful condition, both under

the act to regulate commerce and under the Elkins Act, until the overcharge has been adjusted. We are advised that the delay in making repayment is frequently due, not to the failure to discover the overcharge, but to the efforts of the delivering carrier to ascertain before making the refund to the shipper which carrier participating in the movement is responsible. This is not a proper practice. The shipper is entitled to repayment from the carrier that has collected the freight charges as soon as it appears that an overcharge has in fact been made. When the refund has been made it is then that carrier's duty to see which of the carriers that participated in the movement is responsible and charge it accordingly. When the overcharge has been discovered it should immediately be repaid by the carrier that collected the charges, and this should be done whether a demand has been presented by the shipper or not.

The amended act to regulate commerce gives the commission no authority to establish any limit of time for the adjustment of claims or any authority to discipline carriers that are not attentive to their plain duty in such matters. Carriers owe it to themselves not to put the commission under the necessity of calling this matter to the attention of the Congress and asking for power to compel them to do what, in their own interest and in fairness to shippers, should be done on their own initiative. (17 I. C. C., 330.)

Increased Cotton-Seed Oil Rate Upheld.

Memphis Cotton Oil Co. et al. v. Illinois Central et al. Opinion by Commissioner Harlan.

The long-continued maintenance of a lower rate raises no presumption of law that a newly established higher rate is unreasonable. The fact that the lower rate remained undisturbed for many years has probative value and considered merely as evidence must ordinarily have much weight, in the absence of some explanation showing the propriety and need of an increased rate. But in every case all pertinent facts must be considered before an increased rate may be held to be unreasonable and therefore unlawful. On the facts shown of record the present increased rates on cotton-seed oil from Memphis to Louisville, Cincinnati and Chicago are not found to be unreasonable, although lower rates between those points had been in effect for many years.

Rates on Empty Beer Kegs.

Pabst Brewing Co. et al. v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner Lane.

It is not the province of the commission to order reparation for the exaction of an alleged unreasonable charge merely on a showing that the carrier is willing to honor the claim. An award of reparation can be predicated only on an affirmative finding that the rate exacted was in fact excessive.

The commission will inquire with particular care into the merits of complaints which are presented by shippers and carriers jointly lest unlawful preferences be unwittingly sanctioned.

Rate assessed on shipments of empty beer packages from Omaha, Neb., and Kansas City, Mo., to Milwaukee, Wis., not found unreasonable. Complaint dismissed. (17 I. C. C., 359.)

Through Rates to Points in Mexico.

Awbrey & Semple v. Galveston, Harrisburg & San Antonio et al. Opinion by Commissioner Clements.

Defendants collected on complainant's shipments of cement from Galveston, Tex., to Magdalena, Mex., a so-called through rate of $1 per 100 lbs., made up on a combination of 75 cents from Galveston to Guaymas, Mex., plus a rate of 25 cents from Guaymas to Magdalena. The 25-cent rate was the lawful rate established by the Mexican government, but was not on file with the commission. The rate from Galveston to Nogales, Ariz., an international point, was 62½ cents, and the rate from Nogales to Magdalena was 6 cents, the latter rate having been lawfully established by the Mexican government, making a combination of 68½ cents, but the rate from Nogales to Magdalena was not on file with the commission. In the absence of the publication of a specific through rate from Galveston to Magdalena, the lawful rate applicable to these shipments was defendants' published rate of 62½ cents from Galveston to Nogales plus the lawful rate of 6 cents prescribed by the Mexican government from Nogales to Magdalena. Reparation awarded. (17 I. C. C., 267.)

STATE COMMISSIONS.

The Michigan Railway Commission has sent notices to the railways and to the shippers' associations of the state that it will not be governed by the uniform demurrage code recommended by the National Association of Railway Commissioners and by the Interstate Commerce Commission, and that all rules and regulations proposed by railways relating to demurrage must be filed with and approved by the state commission, which will determine whether or not they are adapted to local conditions.

Frank E. Payne, of Jeffersonville, Ind., has been appointed a member of the Indiana Railway Commission to succeed Henry M. Dowling, resigned. The appointment of Mr. Payne fulfills a promise made by Governor Marshall during the political campaign preceding his election that he would appoint to the commission a member of some railway brotherhood. Mr. Payne is a locomotive engineer and was in the employ of the Pennsylvania Railroad. He was endorsed by the Indiana lodges of the Brotherhood of Railway Trainmen, the Brotherhood of Locomotive Engineers, the Brotherhood of Locomotive Firemen and Enginemen, and the general committee on adjustment of the Brotherhood of Locomotive Engineers of the Pennsylvania Lines West of Pittsburgh.

The New York State Public Service Commission, Second district, responding to complaints of trains constantly behind time, has ordered the Erie to run two trains on the schedule of its eastbound No. 8 from Jamestown to Hornell, whenever the train from the west is half an hour late, and to start train 114 from Jamestown for Buffalo regularly on time. It appears that No. 114 has waited for a western connection so much that complaints have been numerous. The order in relation to No. 8 says that in case of delay (as mentioned) a train must be started from Jamestown on time, with two or more passenger cars and a baggage car. The commission has called for new reports of passenger train delays on the Erie for the past year and a half, the reports which have been received month by month proving to have been made in a way that did not conform to the directions of the commission.

Oswald West, a member of the Railway Commission of Oregon, has written a letter to the Railway Commission of Tennessee, opposing legislation to permit railways to give passes to state railway commissioners. The Tennessee commission started the movement to have the Interstate Commerce law amended so as to permit state commissioners to use passes. In the course of his letter Mr. West says: "The legislature of this state makes liberal appropriations to assist us in carrying out the purposes of the Railroad Commission Act, and these appropriations cover traveling expenses and relieve us of the necessity of accepting favors to which we think we are not entitled.

"We regret that your state does not see fit to appropriate money to pay your traveling expenses and we believe that it would be far better to start a campaign of education at home to secure more liberal appropriation for traveling expenses than to try to bring about an amendment, such as you suggest, to the interstate commerce law, for if you succeed it will only be an opening wedge and in a very short time every public official, as in the good old days, will be flashing a cardboard when the conductor comes along."

The Iowa Railway Commission has made a ruling requiring the Chicago, Milwaukee & St. Paul to accept loaded coal cars from other roads for delivery on its road. The facts in the case are as follows: The St. Paul refused to accept coal shipped from Illinois mines to Davenport, Iowa, for reshipment to other points, unless before reshipment the coal was transferred from the cars in which it was brought to cars belonging to the St. Paul. The coal dealers of Davenport com-

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF NOVEMBER, 1909.

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Atchison, Topeka & Santa Fe	7,458	$5,536,504	$1,660,020	$7,798,337	$1,330,802	$1,128,687	$147,490	$2,068,081	$146,268	$4,821,328	$2,977,009	.....	$287,658	$2,689,351	$95,028
Atlantic Coast Line	4,482*	2,010,643	550,024	2,746,292	337,375	348,334	41,335	764,036	62,213	1,553,293	1,192,999	.....	95,500	1,097,499	336,348
Boston & Maine	2,242	2,364,001	1,121,090	3,746,625	492,379	424,069	35,053	1,514,797	76,022	2,542,320	1,204,305	$5,282	181,927	1,027,660	217,791
Chesapeake & Ohio	1,939†	2,178,430	384,030	2,657,437	266,176	525,619	46,533	684,444	52,639	1,575,411	1,082,026	—3,757	67,500	1,010,769	305,544
Chicago & Eastern Illinois	965	875,918	145,872	1,072,515	95,937	218,040	20,620	341,609	32,814	709,020	363,495	—2,256	32,400	328,839	59,550
Chicago & North Western	7,638	4,569,334	1,523,824	6,586,681	863,049	828,909	114,846	2,617,356	102,608	4,526,768	2,059,913	—6,508	228,000	1,825,405	—46,925
Chicago, Burlington & Quincy	9,021	5,517,515	1,812,338	7,952,241	1,371,739	1,402,348	141,614	2,364,346	172,783	5,452,830	2,499,411	—18,465	215,587	2,265,359	554,319
Chicago, Rock Island & Pacific	7,393	3,657,611	1,494,286	5,467,794	938,607	737,730	122,620	1,989,535	146,840	3,935,332	1,532,462	—16,994	222,118	1,293,350	265,670
Chicago, St. Paul, Minn., & Omaha	1,739	964,204	370,688	1,427,236	149,071	146,508	23,307	490,804	26,608	836,298	590,938	—591	53,008	537,339	84,171
Colorado & Southern	1,248	742,404	115,711	901,747	108,744	118,124	16,098	282,847	21,179	546,992	354,755	—1,719	21,625	331,411	43,507
Delaware & Hudson Co.	845	1,571,744	178,150	1,838,466	95,054	189,673	18,478	571,005	37,232	911,442	927,024	—585	40,000	886,439	167,199
Delaware, Lackawanna & Western	931‡	2,503,289	539,948	3,232,599	253,392	392,391	48,699	858,623	52,070	1,605,175	1,627,424	47,847	151,600	1,523,671	7,560
El Paso & Southwestern Co.	867	513,323	92,247	633,681	78,373	77,454	12,260	155,021	21,802	344,910	288,771	—754	26,167	261,850	—20,513
Erie	1,961§	5,258,631	693,459	4,240,370	375,262	687,401	86,120	1,313,751	82,763	2,545,297	1,695,073	—5,226	108,930	1,580,917	647,243
Great Northern	7,037°	4,690,297	1,151,914	6,135,465	623,894	619,181	67,151	1,589,701	75,970	2,975,897	3,159,568	10,272	318,650	2,851,190	—83,341
Gulf, Colorado & Santa Fe	1,518	952,015	251,620	1,271,128	209,200	172,314	25,404	413,089	29,306	849,313	421,815	.....	32,649	389,167	—87,797
Illinois Central	4,550	3,516,693	965,554	5,095,180	556,783	1,081,757	107,487	1,630,531	107,163	3,483,721	1,611,459	—6,025	208,074	1,397,360	5,442
Kansas City Southern	827	634,243	111,924	832,256	82,487	99,107	25,001	266,532	34,084	507,211	325,045	.....	25,831	299,214	25,948
Lehigh Valley	1,441	2,880,140	308,898	3,302,219	285,275	498,485	71,644	927,405	53,233	1,836,042	1,466,177	847	94,600	1,372,424	408,682
Missouri, Kansas & Texas	3,072	1,615,547	676,321	2,433,439	323,752	301,513	48,352	957,734	79,637	1,710,988	722,451	975	95,010	628,416	79,536
Nashville, Chattanooga & St. Louis	1,230	725,752	204,743	989,554	153,659	160,765	37,216	328,345	22,555	702,540	287,014	—3,774	20,500	262,740	72,873
New York, New Haven & Hartford	2,045	2,646,503	2,054,786	5,161,870	591,847	565,299	26,260	1,904,584	130,828	3,218,818	1,943,052	125,000	330,000	1,738,052	482,960
New York, Ontario & Western	545	562,733	88,068	677,327	61,102	111,374	14,344	261,484	18,801	467,106	210,221	—6,384	16,666	187,171	48,125
Norfolk & Western	1,941	2,596,064	301,604	2,990,353	308,838	470,847	41,500	821,040	54,588	1,696,813	1,293,540	—678	84,000	1,208,862	321,328
Northern Central	466	916,259	170,909	1,148,755	69,945	226,774	13,994	469,353	20,089	800,155	348,600	922	24,708	324,814	132,391
Oregon Short Line	1,508‖	1,407,198	402,758	1,906,918	166,817	147,208	25,087	383,552	34,132	756,796	1,150,122	—3,473	50,000	1,096,649	22,823
Pennsylvania R.R. Co.	4,017	10,685,674	2,531,695	14,157,551	1,178,258	2,614,228	155,742	4,426,210	307,847	8,682,285	5,475,266	—121,702	197,526	5,156,038	1,382,923
Pennsylvania Co.	1,416	3,829,840	564,052	4,742,466	503,759	753,547	66,560	1,445,983	71,772	2,841,621	1,900,845	—7,720	150,280	1,742,845	690,891
Pere Marquette	2,330	1,004,574	288,483	1,390,746	177,119	181,348	29,044	527,367	29,422	944,300	446,446	9,717	47,372	408,791	80,525
Philadelphia, Balto. & Washington	716	761,005	586,008	1,501,350	144,559	259,776	20,205	609,677	29,293	1,063,510	437,840	.....	35,772	402,068	40,838
Pittsburgh, Cin., Chic. & St. Louis	1,468	2,464,948	569,176	3,406,473	411,507	550,843	61,317	1,041,140	60,198	2,125,005	1,281,468	—866	105,017	1,175,585	457,667
Southern Pacific Co.—Pacific System	6,060¶	5,435,716	2,407,610	8,385,436	920,635	1,009,426	109,555	2,120,540	201,861	4,362,017	4,023,419	—29,505	240,063	3,753,851	700,151
Southern Ry.	7,050	3,506,181	1,204,138	5,089,245	607,385	784,009	123,748	1,648,925	146,290	3,310,357	1,778,888	—1,652	157,933	1,619,303	335,922
Texas & Pacific	1,885	1,197,472	319,801	1,599,683	142,216	193,355	22,993	577,668	33,082	969,314	630,369	—11,515	77,762	541,092	—27,385
Vandalia	827	584,272	164,253	834,500	138,061	142,788	21,248	286,809	17,727	606,633	227,867	.....	24,086	203,781	27,022
Yazoo & Mississippi Valley	1,370	767,070	227,868	1,057,266	151,669	165,828	16,640	285,925	24,891	644,953	412,313	1,309	34,740	378,882	—31,801
FIVE MONTHS OF FISCAL YEAR.															
Atchison, Topeka & Santa Fe	7,458	25,013,188	8,723,296	36,469,841	5,774,428	5,267,932	676,925	9,607,896	749,173	22,076,354	14,393,487	.....	1,301,489	13,091,998	1,974,363
Atlantic Coast Line	4,482*	7,836,833	2,482,050	11,080,800	1,619,048	1,740,499	190,566	3,452,954	298,340	7,301,407	3,779,393	.....	472,000	3,307,393	800,127
Boston & Maine	2,242	10,895,590	7,075,958	1,931,828	2,609,989	2,090,930	212,925	7,505,797	382,474	12,802,115	6,517,713	52,073	852,696	5,717,090	927,028
Chesapeake & Ohio	1,939†	10,410,249	2,239,342	13,149,265	1,485,546	2,467,528	219,174	3,315,975	233,959	7,722,182	5,427,083	—5,296	337,500	5,084,287	989,627
Chicago & Eastern Illinois	965	3,911,936	807,362	4,972,104	452,827	888,981	111,964	1,551,403	160,502	3,165,677	1,806,427	—7,196	162,000	1,637,231	453,335
Chicago & North Western	7,638	22,617,198	8,718,508	33,824,726	5,523,937	3,883,640	596,674	11,755,270	485,762	22,245,283	11,579,443	—7,566	1,140,000	10,431,877	—324,619
Chicago, Burlington & Quincy	9,021	25,329,228	10,511,036	38,849,135	7,693,897	6,352,739	716,975	11,069,204	887,696	26,720,511	12,128,624	—64,726	1,077,976	10,985,922	—37,491
Chicago, Rock Island & Pacific	7,393	17,627,260	8,719,477	27,922,492	4,565,435	3,338,141	607,622	9,373,604	685,561	18,570,363	9,352,129	—72,284	1,001,147	8,278,698	1,466,666
Chicago, St. Paul, Minn., & Omaha	1,739	4,228,018	2,043,360	6,688,689	995,538	746,796	118,072	2,233,100	137,052	4,230,558	2,458,131	2,414	265,039	2,195,506	157,978
Colorado & Southern	1,248	3,110,544	823,693	4,140,196	578,272	651,366	73,110	1,239,478	104,474	2,646,700	1,493,496	—786	108,125	1,384,585	175,090
Delaware & Hudson Co.	845	6,578,488	1,544,820	8,542,503	613,891	1,076,448	112,140	2,732,376	179,857	4,714,712	3,827,791	2,387	180,000	3,650,178	244,274
Delaware, Lackawanna & Western	931‡	11,350,436	3,227,495	15,489,776	1,575,866	1,960,376	264,641	3,947,745	271,894	8,020,522	7,469,254	165,831	652,500	6,982,585	765,402
El Paso & Southwestern Co.	867	2,402,013	428,283	2,962,257	381,355	386,338	55,007	782,485	112,418	1,717,603	1,244,654	—3,242	94,834	1,146,578	46,188
Erie	1,961§	14,795,437	4,024,720	20,253,712	2,507,193	3,456,307	447,103	6,163,101	405,214	12,978,918	7,274,794	25,066	522,137	6,777,723	1,122,433
Great Northern	7,037°	22,734,442	6,889,219	31,078,621	4,696,332	3,075,676	374,687	7,267,857	417,887	15,832,439	15,246,182	218,827	1,490,940	13,974,069	2,829,769
Gulf, Colorado & Santa Fe	1,518	3,789,845	1,330,398	5,440,749	992,519	771,017	114,624	1,906,663	145,162	3,929,985	1,510,764	.....	161,566	1,349,198	—318,344
Illinois Central	4,550	16,153,232	5,183,966	24,244,939	3,980,667	5,599,397	514,965	7,783,278	490,684	18,368,991	5,875,948	—17,851	1,026,208	4,831,889	116,389
Kansas City Southern	827	2,812,005	604,520	3,808,903	441,518	521,641	126,797	1,241,539	147,571	2,479,066	1,329,837	.....	126,948	1,202,889	—110,391
Lehigh Valley	1,441	12,628,905	2,037,462	15,214,924	1,630,751	2,484,941	377,927	4,212,767	289,681	8,996,067	6,218,857	55,045	473,000	5,800,902	738,877
Missouri, Kansas & Texas	3,072	7,904,991	3,300,007	11,858,585	1,598,389	1,423,122	258,760	3,906,917	358,305	7,545,493	4,313,092	—9,204	430,109	3,873,779	586,143
Nashville, Chattanooga & St. Louis	1,230	3,356,804	1,136,491	4,780,180	760,032	844,594	178,409	1,600,546	111,756	3,495,337	1,284,843	—5,398	102,500	1,176,945	120,881
New York, New Haven & Hartford	2,045	12,677,732	14,235,971	26,131,440	2,950,091	2,720,930	135,373	9,303,779	602,182	15,712,355	10,419,085	613,482	1,550,000	9,482,567	2,548,955
New York, Ontario & Western	545	2,718,321	926,339	3,812,308	535,712	549,051	58,228	1,316,254	84,803	2,544,048	1,268,260	—14,352	83,333	1,170,575	—34,635
Norfolk & Western	1,941	12,310,996	1,783,482	14,543,358	1,489,110	2,448,939	219,861	3,978,965	289,378	8,426,253	6,117,105	—8,382	420,000	5,688,723	1,112,006
Northern Central	466	4,231,145	961,980	5,478,979	602,973	1,001,607	68,519	2,249,681	102,596	4,025,376	1,453,203	5,149	123,542	1,334,810	107,499
Oregon Short Line	1,508‖	6,107,534	2,529,430	9,122,957	926,148	673,808	113,649	1,731,642	151,664	3,596,911	5,526,046	13,628	250,000	5,289,674	845,388
Pennsylvania R.R. Co.	4,017	49,867,340	13,806,962	57,880,007	8,073,076	12,128,350	871,999	21,124,199	1,483,776	43,681,400	24,198,607	—421,295	987,631	22,789,681	4,390,298
Pennsylvania Co.	1,416	18,698,395	3,428,148	23,753,538	2,789,245	3,484,717	342,064	6,729,433	358,120	13,703,579	10,049,959	—13,584	723,390	9,312,985	2,325,169
Pere Marquette	2,330	4,610,258	1,830,303	6,940,648	951,961	891,061	164,583	2,512,418	141,221	4,661,244	2,279,404	7,422	237,950	2,048,876	357,929
Philadelphia, Balto. & Washington	716	3,923,370	3,021,955	7,652,673	1,053,225	1,297,193	114,738	2,846,868	151,291	5,463,315	2,189,358	.....	178,858	2,010,500	227,253
Pittsburgh, Cin., Chic. & St. Louis	1,468	11,390,178	3,392,600	16,527,426	2,239,197	2,717,995	325,376	5,022,149	287,460	10,592,177	5,935,249	—4,138	542,244	5,388,867	1,159,152
Southern Pacific Co.—Pacific System	6,060¶	25,131,931	13,813,307	41,532,053	4,371,208	5,083,154	566,915	10,057,438	995,856	21,074,571	20,457,482	34,541	1,200,313	19,291,710	4,302,388
Southern Ry.	7,050	15,965,858	6,493,153	24,255,806	2,949,548	4,022,617	566,900	7,649,205	698,919	15,887,189	8,368,617	5,474	789,725	7,584,366	872,546
Texas & Pacific	1,885	4,648,872	1,690,473	6,687,314	777,764	1,004,290	101,935	2,395,311	167,709	4,447,009	2,240,305	—26,067	236,534	1,977,704	269,984
Vandalia	827	2,740,132	989,860	4,144,956	620,175	697,061	121,744	1,404,561	92,410	2,935,951	1,209,005	.....	119,587	1,089,418	153,988
Yazoo & Mississippi Valley	1,370	2,941,073	915,958	4,124,823	1,032,169	802,471	81,123	1,315,795	121,938	3,353,496	771,327	15,550	173,700	613,177	252,246

* Mileage operated November 30, 1908—4,407; † Mileage operated November 30, 1908—1,896; ‡ Mileage operated November 30, 1908—893; § Mileage operated November 30, 1908—1,901; ° Mileage operated November 30, 1908—6,850; ‖ Mileage operated November 30, 1908—1,456; ¶ Mileage operated November 30, 1908—5,586. — indicates Deficits, Losses and Decreases.

plained to the railway commission. At the hearing counsel for the railway contended that the state commission lacked jurisdiction, as the shipments in question were interstate. The coal dealers, however, contended that the interstate character of the shipments ended when the coal was delivered at Davenport and the dealers paid the transportation charges to the originating carriers, and that the local shipments from Davenport to other points in Iowa were purely state traffic and, therefore, under the jurisdiction of the commission. The commission upheld the contention of the dealers and ruled that under the Iowa law the St. Paul must accept the coal in the cars in which it was brought to it by the originating roads. The initial cause of the controversy appears to have been that the Iowa rate on coal is lower in proportion than the interstate rate and that the shippers by stopping the coal at Davenport and reshipping it from there get a lower rate than they would get by shipping it direct from the mines in Illinois to the actual destinations. The St. Paul objected to this method of cutting the rate and seemingly aimed to prevent it by compelling a transfer of the coal to its own cars.

COURT NEWS.

The Appellate division of the Supreme Court of New York, Third department, has sustained the lower court in upholding the constitutionality of the law of the state requiring railways to pay their employees twice a month.

The Supreme Court of the United States in an opinion by Justice Day holds invalid the ordinance adopted by the City Council of Minneapolis in 1907, requiring the Minneapolis Street Railway Company to sell six tickets for 25 cents. The defense claimed that the ordinance was a violation of the contract implied in its charter, which, issued in 1873, was to run for 50 years and authorized a charge of 5 cents for each ride. The United States Circuit Court for Minnesota declared against the ordinance, and Justice Day's decision sustained that finding, but with modifications.

The Denver & Rio Grande has brought suit in the federal court at Denver to restrain the Interstate Commerce Commission from enforcing a recent order requiring the road to reduce its rate on beer from St. Louis to Leadville Colo., from 42 cents to 30 cents per 100 lbs. The order was issued in the case of Baer Brothers Mercantile Company. The through rate from St. Louis to Leadville was previously the sum of the local rates. The order of the commission fixes a through rate which is less than the sum of the locals. The issuance of this order was opposed by commercial organizations at Denver, Pueblo and other points, on the ground that the rate from St. Louis should continue to be the sum of the local rate in order that the brewers of Colorado could compete at Leadville with those at St. Louis. In contesting the order of the commission the railway will have the assistance of the Colorado brewers and commercial organizations.

Judges McCormick and Selby in the federal court at Galveston, Tex., December 23 decided in favor of the Interstate Commerce Commission in the case against the Southern Pacific Terminal Company. In 1908 Carl Eichenberg filed a complaint with the commission, alleging that the contract entered into by the Southern Pacific Terminal Company in 1905 with E. H. Young, by which the Terminal company's Pier C at Galveston was leased to Young and certain privileges were granted to him with respect to handling and storing cotton seed, meal and cake, was unlawful, in that it gave him undue preference. The commission held that the Terminal company was an integral part of the Galveston, Harrisburg & San Antonio Railway, which is owned by the Southern Pacific Company and was, therefore, subject to the jurisdiction of the commission. It held further that if the Terminal company may make a contract with a shipper of cotton seed and give him certain special privileges, it may make similar contracts with regard to other products and thus secure to favored shippers the control of export business at Galveston. It said that the giving of undue preference to any shipper is condemned by the Interstate Commerce law and it can make no difference that such preference is given by a contract which purports to be a lease of property. The court took the same view.

Railway Officers

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

R. H. Ford has been appointed auditor and paymaster of the Texas & Gulf, with office at Longview, Tex., succeeding S. R. Mealy.

George D. Locke has been appointed vice-president and general manager of the Arkansas, Oklahoma & Western, with office at Rogers, Okla.

L. V. Porter has been appointed assistant auditor of the Mahoning Coal Railroad, a New York Central line, with office at Cleveland, Ohio, succeeding George M. Glazier, who has been promoted.

G. C. Hand, examiner in the Bureau of Statistics and Accounts of the Interstate Commerce Commission at Washington, D. C., has been appointed secretary and transfer agent of the Kansas City Southern, with office at New York, succeeding R. B. Sperry, resigned.

As noted in another column, Daniel Willard, vice-president of the Chicago, Burlington & Quincy, has been elected president of the Baltimore & Ohio, effective January 14. Darius Miller, first vice-president of the Chicago, Burlington & Quincy, in charge of traffic, has been made vice-president in charge of all departments.

E. M. Heigho, whose resignation as vice-president, treasurer, general manager and traffic manager of the Pacific & Idaho Northern at Weiser, Idaho, was announced in the *Railway Age Gazette* November 26, has since been elected president and general manager, with office at Weiser, Idaho, succeeding as president F. R. Cordley, resigned. Samuel Norris has been elected vice-president and general counsel, with office in New York, succeeding J. H. Richards, resigned. James B. Ford has been elected treasurer and John D. Carberry has been elected secretary, both with office at New York, succeeding C. W. Webb, secretary and treasurer, resigned. Wm. Wood has been appointed assistant treasurer, F. S. Miller has been appointed assistant secretary and auditor, and I. F. Smith has been appointed attorney, all with offices at Weiser, Idaho.

John Findley Wallace, whose election as vice-president of the Kansas City, Mexico & Orient, with office at New York, was recently announced in these columns, began railway work in 1869 as rodman on the Carthage & Quincy, and in 1870 was appointed assistant engineer on the Rockford, Rock Island & St. Louis. Both these lines are now a part of the Chicago, Burlington & Quincy. He afterwards returned to college, and from 1871 to and including 1876 he was assistant engineer on river and harbor works, in the service of the United States Army Engineering Corps. From 1878 to 1880 he was chief engineer of the Burlington, Monmouth & Missouri River; in 1881 chief engineer and superintendent of the Peoria & Farmington, now a part of the Iowa Central; 1882 to 1883 superintendent and general freight and passenger agent of the Central Iowa in Illinois; 1883 to 1886 master of transportation and engineer of construction of the Eastern and Illinois divisions of the Iowa Central. In 1887 he went to the Atchison,

John F. Wallace.

Topeka & Santa Fe, taking charge of the construction of the bridge over the Missouri river and doing other bridge work. He became chief engineer of the Illinois Central in 1891 and in 1898 he was elected assistant second vice-president of that road; and from 1900 to 1904 he was assistant general manager and later general manager of the Illinois Central system. From 1904 to 1905 he was chief engineer of the Panama canal, and also during part of this time vice-president and general manager of the Panama Railway & Steamship Lines. He acted as confidential consulting engineer from 1905 to 1906 of the Chicago & North Western in the general design of, and estimates for, the new terminal facilities for that company in Chicago, since which time he has been chairman of the board of directors of Westinghouse, Church, Kerr & Co., engaged in the design and construction of railway terminals, interurban railway lines and power, public utility and industrial developments. During Mr. Wallace's connection with the Illinois Central he planned and carried into execution the World's Fair transportation and track elevation scheme of that company, and, in connection with Messrs. J. T. Harahan and Stuyvesant Fish he had charge of the great expansion of this system from 2,880 miles in 1900 to 5,700 miles in 1904. This included the track elevation in the city of Chicago, new machine shops, depression of tracks on the lake front, and revision of the Chicago freight and passenger terminals; the building up and improvement of terminals at East St. Louis, Ill.; Louisville, Ky.; Memphis, Tenn.; New Orleans, La., and at other places; and construction of the Omaha extension from Fort Dodge, Iowa, to Council Bluffs and Omaha, Neb., 140 miles, which was built within nine months.

Operating Officers.

J. E. Toner has been appointed an assistant superintendent of the Oregon Short Line, with office at Pocatello, Idaho, succeeding E. N. Jacobs, resigned.

F. J. Norris has been appointed acting trainmaster of the Missouri Pacific, with office at De Soto, Mo., succeeding J. T. Nedwideck, resigned to go with another company.

F. I. Cummins, traffic manager of the South Dakota Central at Sioux Falls, S. Dak., has been appointed also general superintendent. S. C. Gardner, superintendent transportation at Sioux Falls, has been transfered to the traffic manager's office, and his former office has been abolished.

J. A. Murphy has been appointed trainmaster of the First and Second divisions of the Fort Worth & Denver City, with office at Wichita Falls, Tex., succeeding J. S. Flack, assigned to other duties. Mr. Murphy will have jurisdiction over the territory from Fort Worth, Tex., to Childress.

F. G. Bement has been appointed trainmaster of the Twenty-fifth district (C. S. & M.), Twenty-seventh and Twenty-eighth districts of the Grand Trunk, with office at Durand, Mich., succeeding O. F. Clark, who is transferred to the Twenty-ninth district, and the P. O. & N. Railway, with office at Pontiac, Mich.

S. H. Barnes has been appointed superintendent of the Fourth division of the Colorado lines of the Denver & Rio Grande, with office at Alamosa, Colo., succeeding P. B. McAtee, assigned to other duties. S. E. Burkhead has been appointed assistant superintendent of the First division, with office at Pueblo, Colo. C. M. Payn has been appointed chief despatcher at Pueblo.

C. W. Kinney, superintendent of the Auburn division of the Lehigh Valley at Auburn, N. Y., has been appointed superintendent of transportation, succeeding R. W. Baxter, resigned. C. J. Shea, assistant superintendent of the Buffalo division at Sayre, Pa., succeeds Mr. Kinney, and J. N. Haines, trainmaster at Auburn, succeeds Mr. Shea. G. B. Minshull has been appointed superintendent of car service, with office at South Bethlehem.

F. A. Harrington, superintendent of the Mohawk division of the New York Central & Hudson River at Albany, N. Y., has been appointed assistant to the general superintendent of the Western division, with office at Albany. Miles Bronson, superintendent of the River division at Weehawken, N. J., succeeds Mr. Harrington, and W. K. McCoy, assistant superintendent of the Mohawk division at Albany, succeeds Mr. Bronson, with office at Weehawken. Fred Williamson succeeds Mr. McCoy, with office at Albany.

M. T. Wright, superintendent of the Middle division of the Michigan Central at Jackson, Mich., has been promoted to the new position of superintendent of terminals. W. H. O'Keefe, assistant division superintendent at Detroit, succeeds Mr. Wright. D. H. Hackett, trainmaster at Jackson, has been appointed division superintendent, with office at Jackson. P. C. Hill, trainmaster at Grayling, Mich., has been transferred to Jackson, and Frank Mahoney, acting trainmaster at Jackson, has been appointed trainmaster at Niles, Mich.

The Lake Shore & Michigan Southern now has two assistant general superintendents. Albert S. Ingalls, with office at Cleveland, Ohio, is in charge of the Eastern, Toledo and Franklin divisions and of the Lake Erie, Alliance & Wheeling, the Dunkirk, Allegheny Valley & Pittsburgh and other adjacent lines. Frank H. Wilson, hitherto superintendent of the Western division, has been appointed assistant general superintendent, with office at Chicago, for the Western, Michigan, Detroit and Lansing divisions. E. B. Cook succeeds Mr. Wilson as superintendent of the Western division.

Traffic Officers.

O. R. Eytel has been appointed a traveling freight agent of the Delaware & Hudson, with office at Pittsburgh, Pa.

C. H. Schutte has been appointed claim adjuster of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex.

J. E. Harrington has been appointed a commercial agent of the Louisiana & Arkansas, with office at Shreveport, La.

E. W. Godbold has been appointed a division passenger agent of the St. Louis Southwestern, with office at Texarkana, Tex.

M. K. Fleming has been appointed general baggage agent of the Kansas City, Mexico & Orient, with office at Wichita, Kan.

W. W. Wilson has been appointed a traveling passenger agent of the Illinois Central, with office at Champaign, Ill., succeeding G. A. Hines, resigned.

G. C. McKinstry has been appointed a traveling freight agent of the Atchison, Topeka & Santa Fe, with office at Hutchinson, Kan., succeeding E. H. Hogueland.

W. C. Bates has been appointed a commercial agent of the Nashville, Chattanooga & St. Louis, with office at St. Louis, Mo., succeeding J. R. Chisman, resigned.

All matters pertaining to the traffic and supply department of the Pacific & Idaho Northern will hereafter be handled by the general manager. See item under Executive, Financial and Legal Officers.

B. E. Morgan, manager of the Traders' Despatch at Chicago, has been appointed general freight agent of the New York, Chicago & St. Louis, with office at Cleveland, Ohio, succeeding James Webster, promoted.

J. P. Gibson has been appointed a traveling freight agent of the St. Louis & San Francisco, with office at Houston, Tex., and J. T. Brooks has been appointed a traveling freight agent, with office at San Antonio, Tex.

J. T. Miller has been appointed claim adjuster of the Southern Kansas Railway Company of Texas, the Pecos & Northern Texas, the Eastern Railway Company of New Mexico and the Pecos River, with office at Amarillo, Tex.

Harry F. West, division freight agent of the Middle district of the New York Central & Hudson River at Syracuse, N. Y., has been transferred to Rochester, N. Y. R. C. Hopkins, commercial agent at Buffalo, N. Y., succeeds Mr. West.

F. E. Hine, district passenger agent of the Cincinnati, Hamilton & Dayton and the Chicago, Indianapolis & Louisville, with office at Indianapolis, Ind., has resigned to become a manager for George L. Shuman & Co., publishers, in Chicago.

Harry Ruben, chief clerk of the baggage bureau of the passenger department of the Toledo, St. Louis & Western, the

Chicago & Alton, the Minneapolis & St. Louis and the Iowa Central, has been appointed general baggage agent, with office at Chicago.

Neil Mooney, general western passenger agent of the West Shore, at Chicago, has been appointed general agent of the New York Central & Hudson River at Montreal, Que., succeeding C. Hartigan, appointed general passenger agent of the Rutland Railroad.

W. D. Morgan, contracting freight agent of the Missouri, Kansas & Texas at Houston, Tex., has been appointed traveling freight and passenger agent of the Chicago, Burlington & Quincy, with office at Dallas, Tex., succeeding I. G. Thompson, resigned to accept service with the Rock Island.

Joseph Hattendorf, assistant general freight agent of the Illinois Central and the Yazoo & Mississippi Valley at Memphis, Tenn., has been transferred to Chicago, with authority over these roads and the Indianapolis Southern. J. L. Durrett, commercial agent of the Illinois Central at Jacksonville, Fla., succeeds Mr. Hattendorf. J. J. McManus, commercial agent at Dallas, Tex., succeeds Mr. Durrett. F. P. Redman, commercial agent at Nashville, Tenn., succeeds Mr. McManus, and Willis Hitzing succeeds Mr. Redman.

George R. Browder has severed his connection with the Uniform Classification Committee and will resume his duties as assistant freight traffic manager of the Southern Railway, with office at Washington, D. C. Randall Clifton, general freight agent at Atlanta, Ga., will continue in charge of the Atlanta traffic division and of the general freight office. H. S. Lemmon has been appointed a commercial agent, with office at Memphis, Tenn., and Robert McMechan has been appointed a commercial agent, with office at Little Rock, Ark. G. E. Kirkland has been appointed a soliciting agent, with office at Mobile, Ala., succeeding J. D. Coons, resigned.

H. W. Morrison, general freight agent of the Chicago, Rock Island & Pacific at Little Rock, Ark., has been appointed assistant freight traffic manager, with office at Little Rock, and the position of general freight agent at that place has been abolished. H. A. Snyder, assistant general freight agent of the lines east of the Missouri river at Chicago, has been appointed general freight agent, with office at Chicago, succeeding T. H. Simmons, assigned to other duties. T. A. Gant, chief clerk in the general freight office at Chicago, succeeds Mr. Snyder. R. G. Brown, assistant general freight agent at Minneapolis, Minn., has been appointed general freight agent, with office at Kansas City, Mo., succeeding G. B. Albright, resigned. G. E. White, commercial agent of the Rock Island-Frisco lines at Chicago, has been appointed general agent of the Chicago, Rock Island & Pacific, with office at Chicago, succeeding T. O. Jennings, retained by the Frisco. J. I. Hazzard, soliciting agent, succeeds Mr. White as commercial agent for the Rock Island, with office at Chicago.

In addition to the appointments mentioned in our issue of December 31, page 1322, incident to the dissolution of the Rock-Island Frisco merger, the following appointments have been made on the St. Louis & San Francisco and the Chicago & Eastern Illinois:

C. E. Wynne, Jr., commercial agent at Ft. Worth, Tex., has been appointed division freight agent. W. B. Wells has been appointed commercial agent at Dallas, Tex.; John A. Hulen, commercial agent at Houston, Tex., has been retained. H. C. Franks, commercial agent at San Antonio, Tex., has been retained. Charles Griffith, commercial agent at Paris, Tex., has been retained. F. C. Werner has been appointed district passenger agent at Indianapolis, Ind.

Joint freight and passenger agencies of the St. Louis & San Francisco and the Chicago & Eastern Illinois at the following points have been abolished: Boston, Mass.; Burlington, Cedar Rapids, Davenport and Des Moines, Iowa; Lincoln and Omaha, Neb.; Los Angeles and San Francisco, Cal.; Seattle and Tacoma, Wash.; Pueblo and Colorado Springs, Colo.; Peoria and Rock Island, Ill.; Portland, Ore.; Cleveland, Ohio; Little Rock, Ark.; Minneapolis, Minn.; Topeka, Kan.; Philadelphia, Pa.; St. Joseph, Mo., and Salt Lake City, Utah. Freight agencies at the following points have been abolished: Alexandria, La.; Atchison, Hutchinson and Leavenworth, Kan.; Buffalo, N. Y.; Estherville and Vinton, Iowa; Indianapolis, Ind.; Jonesboro, Ark.; City of Mexico, and St. Paul, Minn. Passenger agencies at the following points have been abolished: Amarillo, Tex.; Chattanooga, Tenn.; Council Bluffs, Iowa; Detroit, Mich.; Hot Springs, Ark.; London, England, and Oakland, Cal.

Engineering and Rolling Stock Officers.

J. E. Mourno has been appointed assistant air-brake instructor of the Chicago, Rock Island & Pacific, with office at Chicago.

L. Fisher has been appointed master mechanic of the Fourth district, Central division, of the Canadian Pacific, with office at Winnipeg, Man.

C. E. Chambers, acting superintendent of motive power of the Central of New Jersey at Jersey City, N. J., has been appointed superintendent of motive power, with office at Jersey City.

J. G. June, assistant engineer of the Erie at Jersey City, N. J., has been appointed engineer of the Buffalo division and branches, with office at Buffalo, N. Y., succeeding R. P. Madill, resigned.

C. S. White has been appointed motive power inspector of the Pennsylvania Lines West of Pittsburgh, Southwest system, with office at Columbus, Ohio, succeeding W. H. Holbrook, transferred.

R. C. Gowdy, resident engineer of the Fort Worth & Denver City at Fort Worth, Tex., has been appointed chief engineer, with office at Fort Worth, and chief engineer also of the Wichita Valley, with office at Wichita Falls, Tex.

W. J. Muff has been appointed a roadmaster of the Atchison, Topeka & Santa Fe, with office at Florence, Kan., succeeding F. Powers. William Turner, recently appointed roadmaster of the Oklahoma division, with office at Guthrie, Okla., has been transferred to Arkansas City, Kan. H. S. Cox succeeds Mr. Turner. E. B. Dehart has been appointed roadmaster of the Colorado division, with office at Pueblo, Colo., succeeding Wm. Davies. D. Bogue has been appointed roadmaster of the Mexico division, with office at Trinidad, Colo., succeeding Charles Ennis. R. R. Black, assistant roadmaster on the Rio Grande division at Vaughn, N. Mex., has been appointed roadmaster, with office at Vaughn, succeeding T. G. McNeill. E. C. Fleming, recently appointed roadmaster of the Rio Grande division, with office at Rincon, N. Mex., succeeds Mr. Black. C. L. McCallister, roadmaster of the Rio Grande division at San Marcial, N. Mex., succeeds Mr. Fleming, and P. Brumbaugh succeeds Mr. McCallister. L. H. McIntire has been appointed roadmaster of the Oklahoma division, with office at Guthrie, Okla., succeeding J. E. Markle.

Alfred Noble has severed his connection with the Pennsylvania Railroad as chief engineer of the East River division of its New York tunnel extension. Since 1902 Mr. Noble has been a member of the Board of Engineers appointed by the late A. J. Cassatt, president of the company, to examine its proposed New York tunnel extension project, pass upon the practicability of the undertaking, and determine upon the best plans for carrying it out. When this work was authorized Mr. Noble was appointed chief engineer of the East River division, which extends from the eastern limits of the New York station at a point in Thirty-second street, Manhattan, 292 ft. east of the west line of Seventh avenue, and at a point in Thirty-third street 502 ft. east of the west line of Seventh avenue; it also includes the excavation work and retaining walls for the station site and yard, to the track level, westwardly to Ninth avenue. It extends eastwardly from the station under Thirty-second and Thirty-third streets through tunnels to permanent shafts a few feet east of First avenue, thence through four single-track tunnels under the East river to the surface in Long Island City, and continues to Woodside, a total of 4.48 miles.

Purchasing Officers.

D. B. Sebastian has been appointed acting fuel agent of the Chicago, Rock Island & Pacific, with office at Chicago, succeeding Eugene McAuliffe, general fuel agent, resigned to go with another company, and the title of general fuel agent is abolished.

Railway Construction.

New Incorporations, Surveys, Etc.

Buffalo, Rochester & Pittsburgh.—A contract has been given to the Miller Construction Co. of Lock Haven, Pa., for work on nine miles of double-track, including grade and line revision, between Newton, Pa., and Mt. Jewett. The work will be very heavy and is to cost about $800,000. These improvements will eliminate the last link of single-track on the main line between Ashford, N. Y., and Punxsutawney, Pa.

Canadian Northern.—According to press reports work was completed during 1909 on 482 miles and grading finished on 398 miles, which is ready for track-laying this spring. In the western prairie provinces 305 miles of track were laid on seven branches and grading has been finished on seven other lines. In Manitoba the Rossburn branch has been extended 50 miles, and from Hallboro 70 miles have been finished through Rapid City to the Saskatchewan boundary. In eastern Canada the Sudbury-Port Arthur line was extended for 30 miles beyond Selliwood, Ont. Ottawa has been connected with the Canadian Northern Quebec by the 58 miles built from Hawkesbury, from which place the company has a line to Quebec City. Work was also started on a second line out of Toronto. About 100 miles of the Toronto-Ottawa line have been let to contractors.

Canadian Roads.—The charters granted to the Northern Empire Railway and the Manitoba & British Columbia have been taken over by a new company, of which Henry Roy, Edmonton, Alb., is the principal promoter. The capital of the company is $4,500,000. The plans call for a line in Alberta via Peace river crossing into Dawson, also for a line from McMurray to Fort Churchill on Hudson bay.

Cherryvale, Oklahoma & Southwestern.—According to press reports financial arrangements have been made and work is to be started at once on the first section of this line from Caney, Kan., south 100 miles. The route is through an oil and coal district of Oklahoma to the white oak lands, where the company expects to secure ties for the remainder of the road. Surveys are made for lines from Cherryvale, Kan., via Pawhuska, Okla., and Guthrie to Geary, 235 miles, as well as from Caney, Kan., to the Grand river, 78 miles. Bonuses have been granted by some of the towns in northern Oklahoma. S. M. Porter, Caney, is the principal promoter.

Chicago & North Western.—This company has work under way on branch lines as follows: From Manitowoc, Wis., on Lake Michigan, through Green bay, which is an important lake port, northwesterly via Gillett and Shawano to Eland junction; from Laona, Wis., north to Saunders, Mich.; Mercer, Wis., east to Fosterville. Two other short lines are now being extended, one from Antigo, Wis., east to Wolf river, and the other northwest from Mercer into the Presque Isle region, near the Michigan state line.

Chicago, Milwaukee & Puget Sound.—The Idaho & Western was recently incorporated in Idaho to build from Plummer, Idaho, northwest to Spokane, Wash. The projected route from Plummer is through the Coeur d'Alene reservation along the west side of the Coeur d'Alene lake to Mica, thence west to Spokane, 75 miles.

Denver & Gulf.—According to press reports this company, which was chartered several years ago, is to be built from Texhoma, Okla., northwest through Texas and Cimarron counties and through Colorado to Lamar, where connection is to be made with the Atchison, Topeka & Santa Fe. This line is to be built on an old survey made by the company through western Oklahoma. It is said that ties and steel are already bought. Another line is to be built southeast across the Panhandle of Texas. F. A. Upstead, president, Minneapolis, Minn.

Gilmore & Pittsburgh.—According to press reports this company has located 40 miles of its proposed line down the Salmon river. The plans call for a line from Armstead, Mont., west via Grant to Junction, Idaho, with a branch from Junction northwest to Salmon and another southeast to Gilmore. Contract let to the McArthur Brothers Construction Co., New York. G. H. Bacon, chief engineer, Machesney building, Pittsburgh, Pa. (June 11, p. 1229.)

Grand Trunk.—This company is said to have under consideration plans for building an extension from Grand Rapids, Mich., south to Kalamazoo, about 50 miles. The work is to be carried out during the coming summer.

Great Northern.—Work on the coast section of the Vancouver, Victoria & Eastern, which will cross the Hope mountains in British Columbia, via the Coquehella divide to the Similkameen extension from Princeton, it is said will be started next spring. It is understood that bids will be asked for the work soon. (Dec. 24, p. 1261.)

Green County Railroad.—An officer writes that this company was chartered in Pennsylvania in May, 1902, since which time surveys have been made and permanent location adopted, but no construction work has been done. A charter was recently taken out in West Virginia for a branch of this company, projected from Waynesburg, Pa., down Dunkard's creek to its mouth, for the purpose of maintaining the rights of the company. S. D. Brady, Parkersburg, W. Va., may be addressed.

Hornell-Bath (Electric).—The New York Public Service Commission, Second district, has granted this company a certicate of public convenience and necessity to build an electric line from Hornell, N. Y., east to Bath, 24 miles. C. Adsit, C. H. Armsted and J. M. Finch, Hornell, and J. F. Turk, Hammondsport, are directors. (Dec. 3, p. 1107.)

Idaho & Washington Northern.—A contract is said to have been let to Grant, Smith & Co., Spokane, Wash., to extend this road from Ione, Wash., north to Metaline, about nine miles. Steel has been ordered for the bridge to be built over the Pond O'Reille river. (Dec. 24, p. 1,261.)

Idaho & Western.—See Chicago, Milwaukee & Puget Sound.

Illinois Traction.—Work is now under way on an extension from Seneca, Ill., east to Morris. The line is ultimately to be extended northeast via Joliet to Chicago. An extension is to be built from Streator southwest to Peoria to connect with the lines on the southern end of the system. Work has been under way for some time on a bridge over the Mississippi river from East St. Louis, Ill., to St. Louis, Mo., and on large terminals. The company now operates about 500 miles of electric lines in Illinois. It is understood that during 1910 improvements will be made straightening curves and reducing grades.

Kansas City, Ozarks & Southern (Electric).—An officer writes that this company recently finished work on eight miles from Bryant river, Mo., to Ava. Plans made for an extension from Ava, southeast, also for another line southwest from Ava. (Nov. 5, p. 894.)

Marshall & East Texas.—See St. Louis & San Francisco.

Mexican Roads.—The San Jose Lumber Co. has graded 30 miles of a narrow-gage line from Santiago bay on the Pacific coast of Mexico, to the San Jose de la Rosa timber tract in the state of Colima. Track laying is to be started about January 15. The line is to be extended through agricultural districts, and is to have a total length of 120 miles. J. H. Clark, chief engineer, Manzanillo. (Oct. 29, p. 828.)

Niagara Falls, Welland & Dunville (Electric).—Application has been made to the Canadian parliament to build an electric line from Niagara Falls, Ont., via Allenburg, thence along the east side of the Welland canal to Port Robinson, through Welland and the Air Line Junction, thence west to Dunville, in all about 50 miles. F. S. Buell, of Buffalo, N. Y., is interested.

Norfolk & Western.—An officer writes that work was started during 1909 double-tracking 46.3 miles of this road in Ohio, and a large part of this is now in operation. The rest of the work is now in progress and will be finished on 18.3 miles between Waverly and Higby and on 14 miles between Delano and Gregg this spring. On both these sections considerable track has recently been laid and is now being

operated. During 1910 double-tracking work will be carried out in Ohio as follows: Between Iron Rock and Wheelersburg, 13.3 miles, which will complete a continuous double-track from the Ohio river crossing to Davis; between Davis and Waverly, 22.6 miles; between Renick and Delano, 5.8 miles, and between Gregg and Cromley, 5.00 miles, a total of 46.7 miles. When all these improvements are finished the road will have a continuous double-track in Ohio between the Ohio river bridge and Columbus.

NORTHERN PACIFIC.—According to press reports plans are under way to build extensions to complete a new line to shorten the distance from Spokane, Wash., to Tacoma and Seattle, about 100 miles. Preliminary surveys are said to be under way for an extension of the Ritzville branch, which is to be built from Ritzville, in Adams county, west to a crossing of the Connell Northern, building from Connell, north to Adrain. The Ritzville line is to be extended further west and will probably join the existing line at Ellensburg in Kittitas county, about 100 miles west of Ritzville. (Oct. 29, p. 828.)

OKLAHOMA ROADS.—Major E. C. Gordon is back of a project to build a line from Chickasha, Okla., northwest to Liberal, Kan. Bonuses have been secured from Weatherford, Anadarko and Chickasha for building 90 miles south of the Canadian river.

OSAGE & WESTERN.—According to press reports the proposed route is from the Missouri, Kansas & Texas at Vinita, Okla., west to Bartlesville, thence westward through Pawhuska and Ponca City to Enid. R. H. Hoss, president, Fairfax, Okla.; C Walters, vice-president and general manager, and E. J. Noonan, locating engineer, both of Muskogee, Okla. (Nov. 5, p. 895.)

OTTAWA, RIDEAU VALLEY & BROCKVILLE.—Application will be made to the Dominion parliament for incorporation to build from Ottawa, Ont., south to Brockville, 60 miles, and to operate a ferry service across the St. Lawrence river from Brockville to Morristown, N. Y. The plans include an extension from Ottawa north to High Falls, Que. D. H. McLean, Ottawa, is solicitor.

PANAMA RAILROAD.—See Panama Roads.

PANAMA ROADS.—According to a consular report a proposition has been made to the Isthmian Canal Commission to build a line from the city of Panama west to David, in the province of Chiriqui, 274 miles, the material and rolling stock to be furnished from the second-hand plant equipment of the Isthmian Canal Commission. The work is to be carried out either by the canal commission or by the Panama Railroad Company.

QUEBEC CENTRAL.—Work on the extension of this road from St. George, Beauce, Que., to Ste. Justine, Dorchester county, is almost finished. It is expected that the line will be put in operation this month. This is to be the first section of a branch to be built towards the Temiscouta Railway, which is 140 miles from St. George. (Oct. 16, p. 1177.)

ST. LOUIS & SAN FRANCISCO.—According to press reports the Marshall & East Texas, which now extends from Winnsboro, Tex., southeast via Marshall to Blocker, 84 miles, is to be extended and used by the Frisco interests as part of a through line from St. Louis, Mo., to southern Texas and Louisiana. The plans include an extension from Paris south to Winnsboro, 50 miles, also an extension from Marshall south about 125 miles to the Orange & Northwestern at Newton.

SOUTHERN.—According to press reports plans are being made to build a line over a new route between Parrish, Ala., and Birmingham. It is expected to have the line in operation in about six months.

VANCOUVER, VICTORIA & EASTERN.—See Great Northern.

WINONA INTERURBAN.—An officer writes that work has been started on the connecting line to close the gap between Mentone, Ind., and Peru. It is expected to have the work finished and cars in operation by the middle of January, 1910. The completion of this line will provide a route for through service from Chicago and points north to Indianapolis as well as through the state of Indiana to Ohio and Kentucky over interurban lines.

Railway Financial News.

CHICAGO GREAT WESTERN.—J. P. Morgan & Co., New York, have sold $18,500,000 first mortgage 4 per cent. bonds of 1909-1959 of the Chicago Great Western. The bonds were offered for subscription at 92.

CINCINNATI, HAMILTON & DAYTON.—Holders of certificates of deposit of the collateral trust 4½ per cent. notes have been notified that they have until January 26 the privilege of dissenting to the terms of exchange given in the reorganization plan of May 24, 1909. Unless holders of 50 per cent. of the notes dissent from the plan it will be binding on all depositors.

DELAWARE, LACKAWANNA & WESTERN.—See an item in regard to the Delaware, Lackawanna & Western Coal Co. under General News.

DETROIT, TOLEDO & IRONTON.—The Central Trust Co., New York, has asked for the appointment of receivers and the sale of the Detroit, Toledo & Ironton, because of default in payment of interest on the $4,500,000 Ohio Southern division bonds. The property is now being operated by receivers appointed after a default in interest on the consolidated mortgage 4½ bonds in February, 1908.

NEW YORK CENTRAL & HUDSON RIVER.—This company has applied to the New York Public Service Commission, Second district, for permission to buy $5,000,000 4 per cent. first preferred stock of the Geneva, Corning & Southern and to issue $5,000,000 N. Y. C. & H. R. 4 per cent. debenture bonds of 1904-1934 in payment therefor. The agreement under which the Central leases the Geneva, Corning & Southern provides that dividends of 4 per cent. shall be guaranteed on the preferred stock of the G., C. & S. by the Central.

NORFOLK & SOUTHERN.—J. W. Van Dyke and others have filed a petition to prevent the delivery of the property of the Norfolk & Southern to the reorganized Norfolk & Southern Railway Co., alleging that the delivery should be made to the petitioners under contract made by the Norfolk & Southern reorganization committee, which provided for $14,000,000 new bonds to replace old securities. The property was bid in for $8,500,000 at foreclosure sale recently by Rathbone Gardner.

PACIFIC & IDAHO NORTHERN.—This road has been reorganized and the following have been elected directors: Edgar M. Heigho, Dr. J. R. Numbers and A. L. Wiley, all with office at Weiser, Idaho; W. H. Truesdale and Samuel Norris, with office at New York.

PORTO RICO RAILWAYS.—The directors have declared an initial quarterly dividend of 1¾ per cent., payable January 10, on the $500,000 preferred stock.

SAN PEDRO, LOS ANGELES & SALT LAKE.—Of the $60,000,000 new first mortgage bonds authorized by stockholders December 21, $48,000,000 are to be issued in the near future. Of these bonds, $40,000,000 are to be used to refund outstanding bonds, $6,000,000 to pay off floating indebtedness, and the remainder for improvements, among which are new shops at Las Vegas, Nev. The bonds were not offered to the public but were taken jointly by President W. A. Clark and the Oregon Short Line.

SOUTHERN PACIFIC.—Of the $76,000,000 preferred stock issued, $74,451,800 has been converted into an equal amount of common stock and the remainder has been redeemed or canceled.

WABASH.—The directors have declared semi-annual dividends of 3 per cent. on the debenture A bonds and 2 per cent. on the debenture B bonds. These dividends were payable January 1. In 1909 6 per cent. annually was paid on the debenture A bonds and 2 per cent. annually on the debenture B bonds.

The government of Chili is said to be considering the electrification of the state railways, one of the arguments advanced for this electrification being the abundant supply of water power, which can be used for generating the electricity.

Supply Trade Section.

Redmond & Co., New York, bankers and security brokers, have opened an office in the new Redmond building, 624 Fifth avenue, New York.

Charles A. Fisher, formerly assistant auditor and assistant treasurer of the Jones & Laughlin Steel Co., Pittsburgh, Pa., becomes treasurer of that company, effective January 1, vice J. B. Laughlin, resigned.

The Isthmian Canal Commission will receive bids until January 24 on steel rail sections, steel shafts, manganese steel chute for rock crushing plant, steel cable, pulsometer pumps, liquid compasses, etc. (Circular No. 551.)

F. Elon Cooper has been appointed manager of the railway department of J. A. & W. Bird & Co., Boston, Mass., with headquarters at the New York office of the company, 31 Union square. Mr. Cooper succeeds C. E. Hoover, who has resigned to go into business for himself.

Frank B. Smith, president of the Crucible Steel Co. of America, Pittsburgh, Pa., died suddenly on December 30 at his home in Sewickley, Pa. At a special meeting of the executive committee held on December 31, Herbert du Puy was elected president to fill the vacancy caused by the death of Mr. Smith.

Geo. L. Kippenberger, for seven years purchasing agent of the St. Louis Car Co., St. Louis, Mo., has resigned that position and since January 1 has been connected with the Forsyth Bros. Co., Chicago. Mr. Kippenberger served as purchasing agent for the American Car Co., St. Louis, Mo., for eleven years before going to the St. Louis Car Co.

The Metropolitan Inspection Bureau, Ft. Dearborn building, Chicago, whose organization was mentioned in the *Railway Age Gazette* of November 19, advises that business is developing satisfactorily. D. W. Schreck, the organizer, has had wide experience as a carpenter, car builder, master mechanic, inspector, superintendent and chief inspecting engineer with a number of companies.

Pursuing the custom established three years ago, the American Blower Co., Detroit, Mich., on Christmas presented each of its employees with a sum, in crisp new dollar bills, equal to the years of their continued service with the company. Accompanying the money was given an illustrated booklet containing a short historical sketch of the company, of which the employees form such an important part.

The American Car & Foundry Co., Railway Exchange, Chicago, has for sale 1,000 forty-ton capacity wooden gondola cars, equipped with cast steel body and truck bolsters, air-brakes, etc. The cars are in first class condition and are ready for immediate delivery. The same company also has for sale twenty-five 87-ton consolidation locomotives about three years old in first class condition and ready for immediate delivery.

Aaron Dean, Jr., formerly western manager of the Federal Signal Co., Albany, N. Y., with headquarters at Chicago, Ill., has been appointed general manager, with headquarters at Albany. H. H. Cade, formerly superintendent of construction, with headquarters at Chicago, has been appointed resident manager, with headquarters at Chicago. C. Henze has been appointed superintendent of construction, with headquarters at Albany.

The Pittsburgh Testing Laboratory, Pittsburgh, Pa., has just purchased property at the corner of Seventh and Bedford avenues, Pittsburgh, on which a five-story fireproof office and laboratory building will be erected during the present year. This new building has become necessary in order to handle the rapidly increasing business of the company. Branch offices at Birmingham, Ala., and Pueblo, Colo., have been established during the past year.

Milliken Brothers, Inc., New York, which placed its affairs temporarily under the protection of the federal courts on June 11, 1907, has now had the receivership terminated. The entire plant and all its assets have been restored to the company. The new officers and board of directors are as follows: E. C. Wallace, president; G. G. Thorne, G. W. McGarrah, E. C. Wallace, A. A. Fowler, C. M. Lewis, W. B. Parsons and C. H. Zehnder, directors. Francis Dykes will be general manager.

N. E. Whitaker, president of the Tyler Tube & Pipe Co., Washington, Pa., died at his home in Wheeling, W. Va., on December 27, after two days' illness of pneumonia, at the age of 71 years. Mr. Whitaker had been prominent in the iron, steel and tin business for over 50 years. He was also president of the Whitaker-Glessner Company, operating the Crescent Iron Works at Wheeling and a nail and sheet plant at Martins Ferry, Ohio, and also a tinplate galvanizing and roofing plant at Wheeling. He was also president of the Portsmouth Steel Co., Portsmouth, Ohio. Mr. Whitaker was also prominent in politics and the political life in West Virginia. He was not only a member of, but was president of the senate for a number of years, and also president of the West Virginia Commission to the Louisiana Purchase Exposition.

Due to the appointment of H. M. Sperry as sales manager of the General Railway Signal Co., Rochester, N. Y., as mentioned in these columns on December 24, M. R. Briney becomes resident manager at New York. Mr. Briney was born at Paxton, Ill. In 1892 he entered the service of the Hall Signal Co., New York, in the construction department. In 1894 he entered railway service with the Chicago & North Western, having charge of construction and maintenance in the signal department. In 1899 he became traffic agent of the Bell Telephone Co., Chicago, and in 1900 he became manager of the Alton Telephone Exchange, Alton, Ill. In 1901 he was made general foreman of the construction department of the Taylor Signal Co., Buffalo, N. Y., and from 1903 to 1906 he was superintendent of construction for the Taylor Signal Co. and also the General Railway Signal Co. at Chicago. In 1906 he became vice-president of the Bryant Zinc Co., New York, and in 1909 entered the employ of the General Railway Signal Co. as construction manager, which position he has held up to the time of his recent appointment.

TRADE PUBLICATIONS.

Buda Calendar.—The Buda Co., Chicago, has distributed a 1910 calendar that is large and attractive, the advertising being limited to small photographs of Buda products on the calendar pad.

Locomotive Erecting Shops.—The Arnold Co., Chicago, has mailed postcards showing four photographs entitled "Half a Mile of Locomotive Erecting Shops." The company in five years has built 12 plants having over a mile of erecting shops and over two miles of erecting pits.

RAILWAY STRUCTURES.

ALTAIR, TEX.—The San Antonio & Aransas Pass is to build a bridge over the Colorado river. The structure will be all steel, having a truss span of 275 ft., two girder spans of 40 ft. and 60 ft., respectively, and 200 ft. of ballasted deck trestles.

ALVIN, TEX.—Work is said to have been started by the Gulf, Colorado & Santa Fe on a new passenger station in Alvin.

DUBOIS, PA.—The Buffalo, Rochester & Pittsburgh will soon start work on the construction of a storage reservoir, with earth fill dam and concrete core wall, on Kyle Run, near Dubois, to supply the Dubois terminal with a continuous gravity supply of pure boiler water. The dam will be 35 ft. high and 1,000 ft. long, and will have a capacity of 500,000,000 gals. The feed line will be 12-in. cast iron pipe, four miles long. Work has recently been finished on a reservoir with a capacity of 100,000,000 gals. for supplying the engine terminal at Punxsutawney, Pa., with pure boiler water.

GALVESTON, TEX.—The Galveston, Houston & Henderson is

building a 14-stall reinforced concrete roundhouse and expects to build a 50-ft. x 120-ft. machine shop soon.

It is thought that the Gulf, Colorado & Santa Fe will spend about $250,000 during 1910 on the proposed new roundhouse, machine shops and turntable. (Oct. 1, p. 616.)

LAS VEGAS, NEV.—See San Pedro, Los Angeles & Salt Lake under Railway Financial News.

LONDON, ONT.—The Canadian Pacific is said to have under consideration the question of putting up a new roundhouse in London this coming spring, also to enlarge its yards.

MARISCAL, MEX.—The Pan-American has applied to the Guatemalan government for permission to build an international bridge over the Suchiate river near Mariscal, Mex. A temporary structure is to be put up pending the construction of a steel bridge.

MONTREAL, QUE.—The Grand Trunk has plans under way for a freight station in the east end to be used at a later time by the Grand Trunk Pacific. To carry out these plans permission has been asked to close the ends of Demontigny, La Fontaine and Logan streets. The proposed station is to be built on St. Catherine street, between Harbor and Frontenac streets. The Lachine, Jacques Cartier & Maisonneuve Railway, a subsidiary of the Grand Trunk, has been granted permission to extend its line through the north and east end of the city, and to close certain streets to reach the site of the proposed freight station on St. Catherine street.

Excavation work is now under way for the foundation of the extension to the Canadian Pacific station on Windsor street. The Foundation Co., New York, and the Bishop Construction Co., Montreal, are the contractors.

OMAHA, NEB.—The Union Pacific has authorized the building of an office building, to be 97 ft. x 177 ft. and 12 stories high. The city ticket offices will occupy the first floor and the remaining floors will be used for the general offices. Jarvis Hunt, Chicago and New York, is the architect, and the building is estimated to cost $1,000,000.

PFLUGERVILLE, TEX.—The Texas State Railway Commission is said to have ordered the Missouri, Kansas & Texas to submit plans within 30 days for a passenger station at Pflugerville.

POINT PLEASANT, W. VA.—It is understood that the Kanawha & Michigan will make improvements to the Point Pleasant bridge over the Ohio river at a cost of $100,000.

SACRAMENTO, CAL.—According to press reports a bridge is to be built over the Sacramento river, to cost about $160,000, at Sacramento. The bridge is to be constructed with a roadway for the Southern Pacific and an overhead structure for highway traffic. The cost is to be borne by the railway company and Sacramento and Solano counties.

ST. LOUIS, MO.—The St. Louis Transfer Co. has opened its new in-bound freight station, which will be used by the Toledo, St. Louis & Western and the Alton lines. The building is 125 ft. wide and 400 ft. long.

Extensive improvements, including the laying of new rails and replacing old bridges with new steel structures, are being made by the Missouri Pacific. Contracts for bridges have been let to the McClintic-Marshall Construction Co. as follows: Eastern division, main line, one beam and 17 plate girder spans for 15 bridges; River line, two girder spans for two bridges; Lexington branch, 12 girder spans for five bridges; Omaha division, two crossings of the Platt river of 20 and 22 spans of 60-in. deck plate girders, and two plate girder spans; Joplin division, 18 plate girder spans for 11 bridges and one through riveted span; Northern Kansas division, one beam span and 13 plate girder spans for seven bridges; Southern Kansas division, three plate girder spans; Central Kansas division, two plate girder spans; Wichita division, 15 plate girder spans for nine bridges; Missouri division, nine plate girder spans for seven bridges; Belmont branch, 23 plate girder spans for 13 bridges; Herrin branch, 15 plate girder spans for eight bridges; White River division, four 60-ft. plate girders for a bridge, and the Black river crossing consisting of a 270-ft. draw span, with one plate girder approach span; Memphis division, White river crossing, a duplicate of the Black river draw span with one 165-ft. truss and two 60-ft. plate girder approach spans.

Late News.

The items in this column were received after the classified departments were closed.

The Pennsylvania is replacing some old machinery in its Altoona shops.

The Barrett Mfg. Co., New York, is in the market for from 50 to 75 tank cars.

The St. Louis, Brownsville & Mexico is in the market for from 30 to 50 forty-ton gondola cars.

The Norfolk & Western is reported in the market for 3,000 freight cars. This item is unconfirmed.

The Ashland Coal & Iron Co., Ashland, Ky., has ordered one locomotive from the Baldwin Locomotive Works.

The Cincinnati, Hamilton & Dayton is taking prices on 1,000 steel underframe Ingoldsby automatic cars.

secutive. This reverses a decision of the lower court, Judge Landis, in the case against the Atchison, Topeka & Santa Fe.

The New York, Chicago & St. Louis is in the market for 1,000 all-wood 30-ton box cars and 1,000 all-wood 40-ton gondolas.

The Pere Marquette is reported to be in the market for 1,000 or 2,000 all-steel 50-ton gondolas. This item is unconfirmed.

The Chesapeake & Ohio is said to have ordered 1,000 freight cars from the Standard Steel Car Co. This item could not be confirmed.

The Carolina, Clinchfield & Ohio has ordered 12 seventy-foot steel underframe coaches from the Hicks Locomotive & Car Works.

According to press reports the Denver & Rio Grande is planning to complete the double-track on its line from Denver, Colo., south to Pueblo.

The Atlantic Coast Line is said to have ordered the 300 flat cars, mentioned in the *Railway Age Gazette* of November 26, from Barney & Smith. This item is unconfirmed.

The Chicago, Burlington & Quincy expects to buy new machine tools for the West Burlington, Iowa, shops within a few months. A heavy crane may also be added to the equipment.

The American Steel Foundries has let a contract for two additional buildings at its Indiana Harbor, Ind., plant. The foundry will be 118 ft. x 620 ft., and the brick storehouse will be 54 ft. x 100 ft.

Following the resignation of Daniel Willard, second vice-president of the Chicago, Burlington & Quincy, in charge of operation, Darius Miller, first vice-president, has been given charge of all departments.

The Railway Specialty & Supply Co., Monadnock block, Chicago, manufacturers of the P. & M. rail anchor and other railway devices, announce the appointment of Fred A. Preston as general sales agent.

A press despatch from New Westminster, B. C., says that work has been begun on the first gyroscope railway in America. It will encircle Okanagan lake. Branches will be run to points where business warrants.

Directors of the Cleveland, Cincinnati, Chicago & St. Louis have declared a semi-annual dividend of 2 per cent. on the common stock, payable March 1. The last previous dividend was 1 per cent. declared in March, 1908.

C. B. Seger, auditor of the Southern Pacific and the Corvallis & Eastern at San Francisco, Cal., has been appointed general auditor of the Southern Pacific, the Union Pacific, the Oregon & Washington, the Oregon Railroad & Navigation Company and the Oregon Short Line, succeeding Erastus

Young, retired. The general auditing department will be transfered to Chicago from Omaha. A. D. McDonald, secretary and auditor of the Pacific Electric Railway at Los Angeles, Cal., succeeds Mr. Seger.

T. B. Akridge, chief clerk in the traffic department of the Georgia & Florida, has been appointed general freight agent, and Charles H. Gattis has been appointed general passenger agent, both with offices at Augusta, Ga.

The Duluth, Missabe & Northern has ordered 1,000 ore cars divided between the Summers Car Company, Pressed Steel Car Co. and the Clark Car Co. The number and division is the same as for the Duluth & Iron Range order mentioned above.

The Fostoria, Napoleon & Defiance has been incorporated in Ohio with $100,000 capital to build an electric line through Seneca, Wood, Hancock, Henry and Defiance counties. The incorporators include: W. S. Reece, R. T. Betts, C. A. Aten, G. Schrock and C. A. Bliss.

According to a press despatch from Minneapolis the Chicago, Milwaukee & St. Paul is confronted with a serious shortage of coal at all points in that region, and this is true both of the retail dealers and of the coal bins of the railway company itself. The despatch indicates that a scarcity prevails on the other lines as well.

A press despatch from Chicago says that the representatives of the western railways there, after protracted negotiations with the switchmen have agreed with the brotherhood leaders to submit the whole question of pay and working conditions to the government arbitrators, Chairman Knapp and Commissioner Neill.

The Allis-Chalmers Co., Milwaukee, Wis., report the following recent sales of machinery: American Steel Foundries, East St. Louis, an additional generating unit, consisting of a tandem compound non-condensing engine, cylinders 16 in. and 26 in. x 36 in., direct-connected to a 300-k.w., 250-volt, d.c. generator; Southwest Missouri Railway, Webb City, Mo., six two-motor, double-end, railway equipments, together with controllers, wiring, etc., motors being of the interpole type; Waterloo, Cedar Falls & Northern, Waterloo, Iowa, 35 panels of switch board equipment; Jones & Laughlin Steel Co., Pittsburgh, Pa., a vertical steeple cross-compound blowing engine, in addition to the 10 already installed by this company.

Governor Hughes, of New York, in his annual message, sent to the legislature last Wednesday, renews his recommendation that the telegraph and telephone companies be put under the Public Service Commissions law, on the same basis as railway companies. The governor announces that Mrs. Edward H. Harriman has offered to give to the state 10,000 acres of land in Orange and Rockland counties for a state park. Mrs. Harriman also offers a million dollars to be used in making additions and improvements to the park, and the governor announces that individual citizens of New York, New Jersey and Philadelphia have subscribed $625,000 for the Palisades park. The Palisades park enterprise is in the hands of a joint state commission of the states of New York and New Jersey, and this and the proposed Harriman park are treated as a single enterprise.

In the United States circuit court of appeals at Chicago last Tuesday, Judges Grosscup, Baker and Seaman decided that the federal hours-of-labor law, fixing nine hours as the day's work for a telegrapher in a railway office kept open continuously, does not mean that the nine hours shall be consecutive. This reverses a decision of the lower court, Judge Landis, in the case of the Atchison, Topeka & Santa Fe, which was tried last April. It appears that it has been a regular thing on the Atchison for day operators to work 12 hours with three hours out at noon, and night operators 12 hours with three hours out at midnight. Judge Landis held this to be a violation of the law. Judge Grosscup says that the statute was enacted in view of the customs of the land, and that our customs do not include such an intermission as a part of the working hours. The case was remanded to the lower courts and a new trial ordered.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Chicago & North Western has ordered 25 consolidation locomotives from the Baldwin Locomotive Works.

The British Columbia Electric is said to be considering the purchase of motive power early next spring. This item is not confirmed.

The St. Louis Southwestern, as mentioned in the *Railway Age Gazette* of December 3, has ordered six ten-wheeled freight locomotives and 10 consolidation freight locomotives from the Baldwin Locomotive Works.

General Dimensions.

	10-wheel.	Consolidation.
Weight on drivers	145,000 lbs.	173,000 lbs.
Total weight	185,000 lbs.	195,000 lbs.
Diameter of drivers	54 in.	48 in.
Driving wheel base	13 ft. 2 in.	16 ft.
Engine wheel base	24 ft.	24 ft. 6 in.
Water capacity	8,000 gals.	8,000 gals.
Coal capacity	15 tons.	15 tons.

The Atlanta, Birmingham & Atlantic, as mentioned in the *Railway Age Gazette* of December 3, has ordered two 2-8-2 locomotives from the Baldwin Locomotive Works.

General Dimensions.

Weight on drivers	200,000 lbs.
Total weight	260,000 lbs.
Cylinders	25 in. x 32 in.
Diameter of drivers	57 in.
Working steam pressure	170 lbs.
Boiler, type	Wagon top
Boiler, diameter	78¾ in.
Firebox, length	108 "
Firebox, width	78 "
Tubes, number	463
" outside diameter	2¼ in.
" length	19 ft.
Total heating surface	536.6 sq. ft.
Grate area	58.5 "
Water capacity	7,000 gals.
Coal capacity	14 tons

The Duluth & Iron Range locomotives, ordered from the Baldwin Locomotive Works, as previously reported in the *Railway Age Gazette*, will have the following general dimensions and special equipment:

General Dimensions.

Weight on drivers	176,600 lbs.
Total weight engine	198,850 "
Total weight engine and tender	338,000 "
Cylinders	22 in. x 28 in.
Diameter of drivers	54 in. (out), 48 in. (centers)
Type of boiler	Straight
Working steam pressure	200 lbs.
Heating surface, tubes	2,696 sq. ft.
" " firebox	168 "
" " total	2,864 "
Tubes, number	321
" outside diameter	2 in.
" length	16 ft.
Firebox, type	Wide
" length	108 in.
" width	66 in.
" material	Steel
Grate area	49.5 sq. ft.
Water capacity	7,000 gals.
Coal capacity	11 tons

Special Equipment

Boiler lagging	Asbestos
Brakes	Westinghouse
Brake-shoes	Armburst
Brick arch	Hollow
Headlight	Schroeder
Injector	Nathan
Journal bearings	Phosphorus bronze
Piston and valve rod packings	Jerome
Safety valve	Ashton
Sanding devices	Leach
Sight-feed lubricators	Nathan
Steam gages	Ashton
Valve gear	Walschaerts

CAR BUILDING.

The Ann Arbor is said to have ordered 1,000 freight cars, 500 of which are to be steel gondolas. This item is not confirmed.

The British Columbia Electric is said to be considering the purchase of rolling stock early next spring. This item is not confirmed.

The Cincinnati, Hamilton & Dayton, reported in the *Railway Age Gazette* of December 24 as asking prices on 15,000 freight

cars, writes that the company is not in the market for this equipment.

The Duluth & Iron Range, reported in the *Railway Age Gazette* of December 24 as having ordered 1,000 ore cars, has divided this equipment as follows: Pressed Steel Car Co., 150 cars of its own design and 100 cars of the Clark design; Standard Steel Car Co., 750 cars of the Summers design.

MACHINERY AND TOOLS.

The Chicago, Burlington & Quincy is in the market for 30 or 40 machine tools.

The Galveston, Houston & Henderson expects to build a machine shop, 50 ft. x 200 ft., at Galveston, Texas.

The Oregon Short Line has issued a list of 54 machine tools for the Ogden, Pocatello, Salt Lake City and Sparks shops.

The Sandwich, Windsor & Amherstburg, Windsor, Ont., Canada, will probably place contracts in a few days for two 500-k.w., three-phase, direct-connected alternators, and two 750-h.p. engines.

IRON AND STEEL.

The Baltimore & Ohio is in the market for 70,000 tons of rails.

The Missouri Pacific rail requirements for 1910 include 100,000 tons of 85-lb. to 100-lb. sections, ordered from the Carnegie Steel Co. and the Illinois Steel Co.

The Maryland Steel Company have under construction open hearth furnaces for their rail mill at Sparrows Point, and will be ready to deliver open hearth rails during May, 1910.

The Buffalo, Rochester & Pittsburgh has placed orders for 6,000 tons of rails for early delivery, divided 2,000 tons each among the Bethlehem, Lackawanna and Carnegie Steel Companies.

General Conditions in Steel.—Chairman E. H. Gary, of the United States Steel Corporation, in a statement just issued, characterizes the outlook in the steel and iron trade for the year 1910 as firm and hopeful. During the month of December the combined bookings of the subsidiary companies of the corporation have been about 50,000 tons per day, while their capacity is only about 41,000 tons per day. The one concern at the mills is being able to satisfy customers in regard to deliveries. The first two weeks of January are not expected to see heavy buying, as stock-taking is still in progress. Current prices for steel when delivered will be the ruling hereafter, the deliveries up to December 31 being made on prices quoted when the contracts were made.

SIGNALING.

It is the intention of the Chicago Great Western to install automatic block signals between Forest Home, Ill., and Oelwein, Iowa, 235 miles of road. Of this about 75 miles is double track. There will be about 250 signals in all. Indications will be given by three positions in the upper right-hand quadrant. Work will not be started until frost is out of the ground in the spring. The company has in view also a considerable amount of single-track automatic block signaling in other territory. Bids have been asked for from the manufacturers, both for material alone and for installation. Whether or not the railway will do the work itself has not as yet been decided.

Dixon's Graphite Front End Finish.

The ordinary and usual treatment of locomotive front ends has a number of unsatisfactory features. It requires frequent renewal, which means cost of material and labor. Some of the material used is volatile, and when the engine is running and the front end becomes hot offensive fumes blow into the cab. In some cases these fumes effect the eyesight of the engineman.

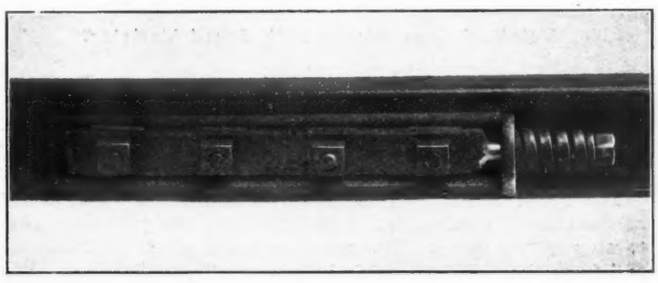
The Joseph Dixon Crucible Co., Jersey City, N. J., recommends its graphite engine front finish, which is said to give a service of from six to nine weeks at each application. It provides the engine front with a durable and attractive coating. The value of this finish is due chiefly to the flake graphite which forms its base. Flake graphite is said to be unaffected by heat or cold and it has durable polishing properties.

Fairbanks-Morse Gasoline Passenger Car.

The International Smelting & Refining Co., Tooele, Utah, has just received from Fairbanks, Morse & Co., Chicago, one of their motor cars for passenger service on the newly built line from Tooele. The car is of the same general type as the one recently sold by this company to the Pennsylvania, and which was fully described in the *Railway Age Gazette* of November 19, page 998. The car has a seating capacity of 35 passengers, and is equipped with a 50-60-h.p. engine of heavy type. Most of the features described in connection with the other car apply to this one. In this car, however, the vibration of the engine has been taken care of by mounting it on the truck frame while the car body is suspended on full elliptical springs.

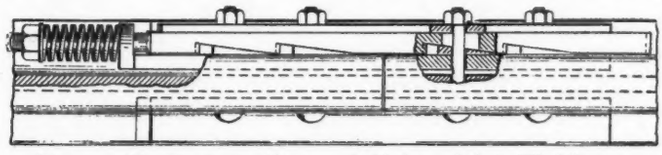
Heber Joint Tightener.

The principal of the Heber joint tightener is evident from the illustrations shown herewith. It is applied to a simple angle bar joint without any change, when the bolts are sufficiently long. A wedge is put over each bolt and a long key, with beveled recesses to slide on the wedges, runs the length



Heber Joint Tightener.

of the angle bar. The key is slotted for each bolt so as to give it longitudinal play. At the end of the key is a helical spring bearing against a stop, which in turn bears against the end of the angle bar on both web and flange. The tension of the spring takes up any wear tending to loosen the joint, so that the bolts are always holding the angle bars snugly against the rail. After the device is first applied and the nuts tightened up, it takes a few weeks for the wearing surfaces to find their proper bearing. The nuts can then be permanently set, the nut at the spring being used for adjustment; and it is



Plan, with Part Sections, of Heber Joint Tightener.

claimed that the joint will then last the life of the rail without further adjustment.

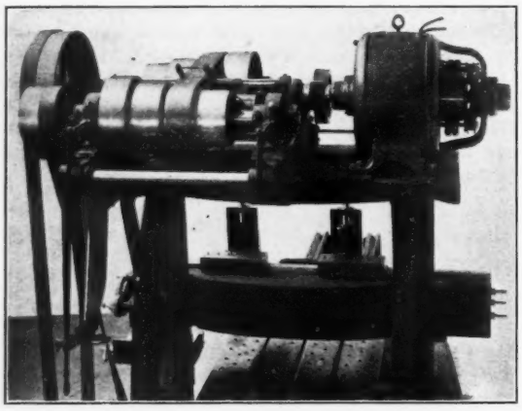
The claims for this device are as follows: The angle bars being held tightly to the rail, the stiffness of the joint is dependent only on the angle bar section; with a properly designed joint there will be no pumping. The fact that all joints are equally tight is an advantage in dealing with rail creeping problems. The contact between key, angle bar and rail is such that the joint has been successfully used in tracks electrified for automatic block signals without the use of bond wires. The improved track surface at the joints and the elimination of lost motion makes it particularly desirable on bridges or any track laid on a metal structure.

The joint is being tested in New York City in tracks of the New York Central & Hudson River and of the Interborough Rapid Transit. It is made by John Heber, New Martinsville, W. Va.

Recent Machine Tools.

Gray Patented Speed Variator.

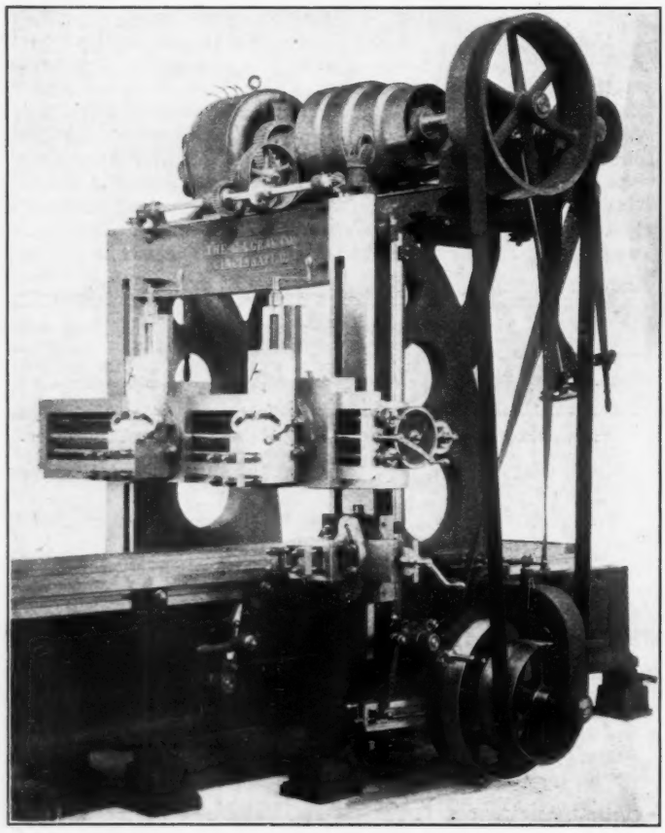
The accompanying illustrations show different views of the Gray patented speed variator. It consists principally of two inversely placed cones, one mounted on the constant speed shaft, on the end of which is the return pulley; the other mounted on the variable speed shaft, on the end of which is the cutting pulley. The constant speed shaft may be driven



Detail of Gray Planer with Speed Variator.

either by belt directly from the line shaft through a pair of tight and loose pulleys, or it may be geared to the motor shaft as illustrated, thus making an entirely self-contained motor-driven equipment. The variable speed shaft is driven from the constant speed shaft by belt.

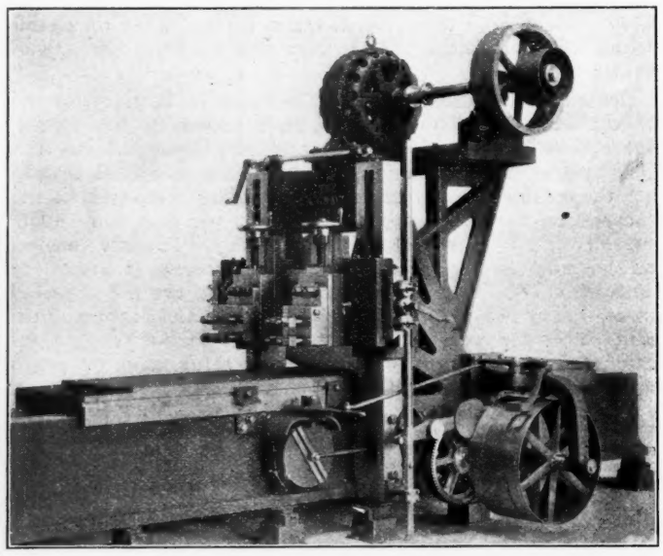
The speed is changed by merely turning the hand wheel at the side of the housing, and this shifts the belt from step to step of the cones. The variable speed shaft is moved to and from the constant speed shaft by means of the long tightening lever, which enables the operator to keep the belt at all times under proper driving tension. This lever also makes it possible to shift the belt when it is slack. The shoulders of the cone steps are beveled off so as to assist the shifting. The mechanism is arranged so that one end of the belt is shifted to the smaller step of one cone before the other end is shifted to the larger step of the other cone. There is thus practically no wear of the belt due to shifting. The hand wheel operates the duplex belt shifter by means of a cam mounted between the cones. Speed can be changed without stopping the motor, and this saves considerable time, since it eliminates the necessity of waiting for the armature and pulleys to come to rest. The momentum of the two cones, supplementing that of the heavy fly-wheel pulley, reduces the strain on the motor at the moment of reversal. The elimination of the usual complication of rapidly running gears not only insures an almost noiseless drive, but also does away with vibration which is found in the self-contained gear devices, especially after they have been in use some time and subjected to the severe duty imposed by planer service. The planers 42 to 56 in. have cutting speeds 22, 30, 37 and 45 ft. and return speed of 90 ft. per minute. This device is made by the G. A. Gray Co., Cincinnati, Ohio.



Gray Planer Fitted with Speed Variator.

Gray Switch and Frog Planer.

The machine here illustrated was designed by the G. A. Gray Co., Cincinnati, Ohio, for the very heaviest kind of switch and frog work. The characteristic features are its enormous power, weight and stiffness. The bed of the machine is 2 ft. deep and is stiffly cross-ribbed by box girders. The table is 32 in. wide and very heavy. It is gibbed underneath, both on the front and rear sides, to prevent direct lifting. In addition to this it is supplied with vertical inside bearings extending the entire length of bed, to counteract the side thrust. It thus becomes impossible to lift the table under the heaviest cuts. The housings are of box form 10 in. wide where the cross-rail takes bearing, thus giving the necessary rigidity to resist the strain of the side tools, which are used almost exclusively for frog and switch work. The cross-rail is 18 in. wide and is double-gibbed; tht is, it is securely fastened to the housings or uprights not only by the regular set of gibbs, but also by an additional set which are bolted to the inside flanges. The saddles have a bearing 24 in. long on cross-rail. The tool boxes are 11 in. wide and have two heavy steel clamps held by 1¼-in. bolts. The gearing and rack are made of crucible steel cut from the solid. The bull wheel and rack are 9-in. face and 2-in. pitch. The driving pulleys carry wide belts. The backing pulley insures a smooth, quick return 4 to 1. The pulley shaft and first intermediate shaft bearings are located in the front housings, thus tying two shafts rigidly together; in fact, the entire driving mechanism

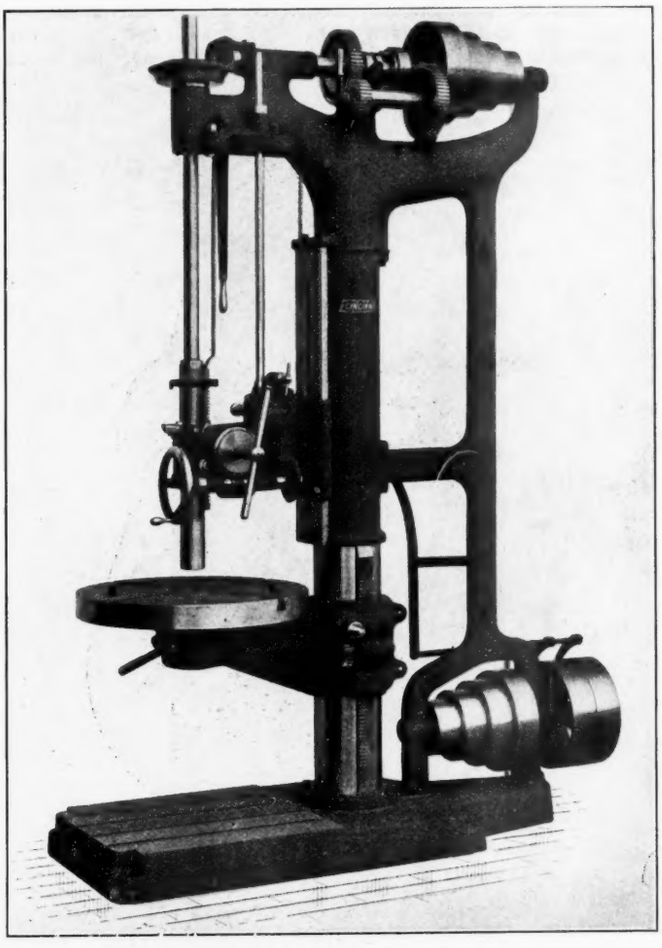


Gray Switch and Frog Planer.

of the machine is rigidly bonded together so as to withstand the enormous strain due to heavy cuts in planing frog and switch rails.

Cincinnati Bickford Upright Drill Press.

Like some of the other large tool manufacturers of Cincinnati, the Bickford Tool Company has for some time concentrated its force and specialized in the manufacture of upright and radial drills only. The business of the concern has outgrown its present shops in the city and it has built in the new industrial suburb of Oakley a new shop, which is especially designed for the manufacture of drill presses. The designs for



Cincinnati Bickford Upright Drill Press.

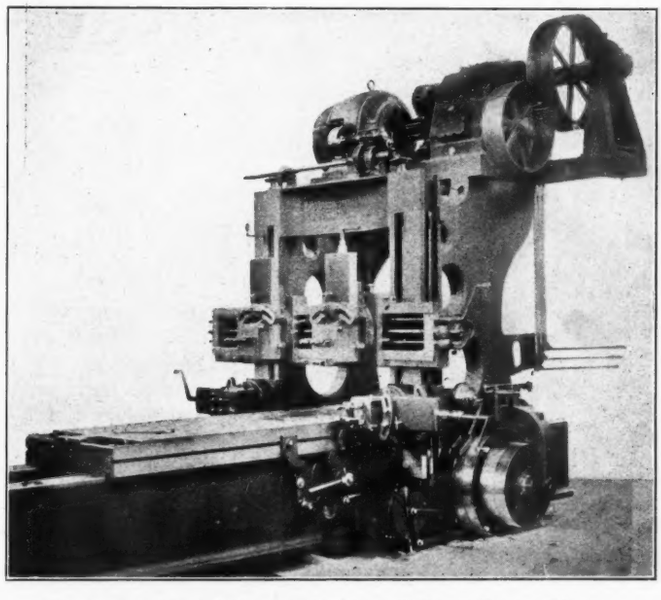
these machines are adapted to the high speeds now required for this class of tools, and they are capable of cutting at the rate of 70 ft. per minute. This is equivalent to 534 revolutions for a ½-in. drill or 267 revolutions for a 1-in. drill. The illustration represents the general design of the heavy pattern sliding head upright drilling machine, which is built in sizes from 24 in. to 42 in.

Among the special features of this design, for which is claimed particular advantage, are the instantaneous stop for the spindle without stopping the machine to make changes of chuck or drills, and the patent gear tapping attachment located directly on the spindle, one of the most important improvements which has been made in the construction of upright drills. The other details in the ordinary make-up of this drill press have been constantly improved, and the following description relates to some of these changes: The column is of large diameter, has a wide face for receiving the head and is supported by a strong back brace. The sliding portion of the column is finished by grinding and insures perfect alinement of the table at any position. The table arm is raised and lowered by means of a rack and pinion driven through a worm and wheel, which arrangement holds the arm in any desired position and makes an accident by dropping of the table impossible. The spindle is provided with ball bearing and jam nuts for adjustment and with an automatic stop, so that any number of holes can be drilled to a fixed depth. The patent positive gear feed box located on the sliding head provides six feeds, graduated in thousandths per revolution of the spindle, any one of which can be used with any speed of the spindle. The friction back gear is a distinctly new feature. It can be left in continuous engagement, and by means of a convenient handle it is placed in operation without stopping the machine. The same lever, when brought to a neutral position, furnishes a stop to the spindle, which has been found to be a most valuable arrangement. On the 42-in. drill the column is 10 in. in diameter and the diameter of the spindle sleeve is $3\frac{7}{16}$ in. The maximum speed of the spindle is 283 revolutions and the power required 3 h.p. The weight of the machine complete is 5,000 lbs.

Forty-two Inch Variable Speed Motor-Driven Forge Planer.

The Cincinnati Planer Company, Cincinnati, Ohio, makes a specialty of one kind of tool and concentrates its energies to the production of a high-class machine. Some of the principal features of its planer are described below.

The bed is made extra long so there is very little overhang of the table when planing full stroke. The table is gibbed underneath by an improved method which insures unusual stiffness. The holes in the table are drilled through so that dirt and chips will fall through and ledges are cast on each side of the Vs to prevent chips falling on the V bearings. The heads on cross rail are of a new shape, the end of the tool block and slide being made circular to avoid projecting corners on angular work. The power elevating device for cross rail is also of new design. It is located at center of arch, thus providing a third bearing for elevating shaft and equal distribution of pull. The shifter reverses without shock or jar, and disagreeable noise from the belts is avoided. The large gears and racks are made from semi-steel casting and the pinion is a steel forging. These planers are built with special reference to high speed steel and are capable of any speed which that material requires. For the return speed the com-



Cincinnati Variable Speed Motor-Driven Forge Planer.

pany does not favor the excessive speeds used by some builders. A planer with return speed of more than 80 ft. per minute is subject to undue shock and wear and it is believed that a return of more than 100 ft. per minute will depreciate a machine twice as fast as one returning at 80 ft. A correct speed for all materials and conditions instantly available is the secret of modern planing economy. The 42-in. planer has six cutting speeds, 15, 20, 25, 30, 35 and 40 ft. per minute, with a constant return of 80 ft. For the maximum speed a 15-h.p. motor is required. A variable speed is one of the

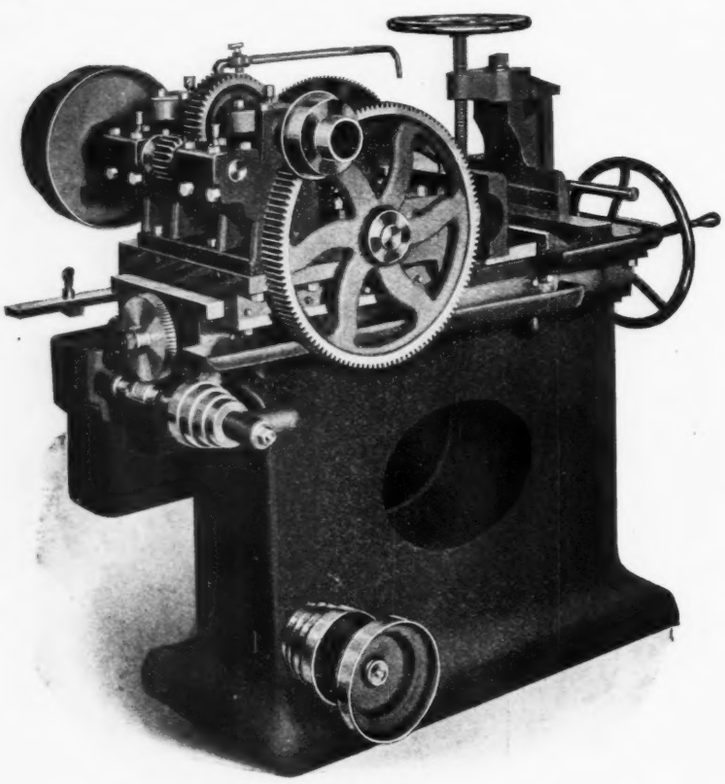
essential features of economy in modern practice, and there is no machine tool which will show a better saving of time than one so equipped. The variable speed used on these planers consists of a speed box mounted on top of the housing. It is completely enclosed and holds several gallons of oil. All the gears and driving hubs are submerged and subject to little or no wear and run noiselessly. This speed variator is adapted to either belt-driven or motor-driven planers. The changes of speed are made by simply moving one of the levers shown at the side of the machine, and the levers are so arranged that it is impossible to engage any two speeds at the same time.

Nutter & Barnes Cutting-Off Machine and Automatic Saw Sharpener.

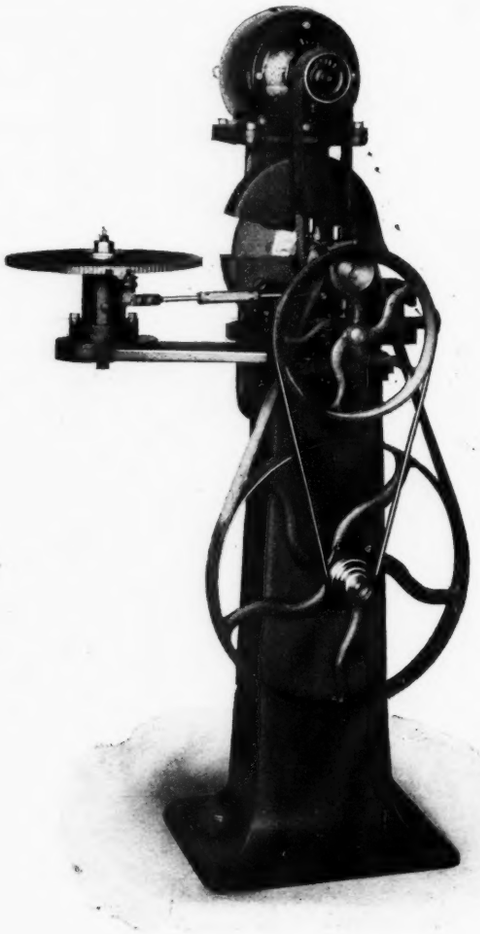
The machine tool builders and those using the harder grades of steel, and especially tool steel, require a form of cold saw which is better than the ordinary ones used for rough bars. The Utter & Barnes saw, which is here illustrated, is well adapted to this purpose and is quite largely used by the tool builders. The special spur-gears in the drive in preference to a worm-wheel drive are used for the purpose of saving the large amount of power which would be otherwise lost in friction. It also enables the use of a small diameter thin saw to cut large bars, thus decreasing the waste of material, which is a large item when cutting expensive steels. The power required to drive a 5½-in. machine is only 2 h.p. and that for the No. 8 machine 3½ h.p. The time required to cut annealed tool steel with a carbon steel saw is, for the machine illustrated, 2 in. diameter, 4 minutes; 4 in. diameter, 8 minutes; 6 in., 13 minutes, and 7 in., 16 minutes. Soft machinery steel is most difficult to cut on account of the liability of the saw to stick, and for this reason a fine feed and high speed of saw is recommended, in some cases as high as 80 ft. periphery speed per minute, and for annealed tool steel 54 ft. per minute. The high carbon and high-speed steel saws furnished with these machines are only ⅛-in. thick for 14-in. diameter, $\frac{5}{32}$-in. for 16 and 18-in. diameter and $\frac{3}{16}$-in. for 20-in. diameter. The driving pulley is 10 in. in diameter, with 3-in. face, making 22 turns of the driving shaft to one of the saw spindle. All the driving gears and shafts are of crucible machinery steel forgings 0.50 carbon. The normal speed of an 18-in. saw is 12 revolutions per minute. This cut-off saw is built more like a machine tool, and is carefully finished with exact fitting, so that the surface of the bar at the cutting end will be not only smooth, but exactly at right angles to the axis of the bar. The weight of this machine is 2,300 lbs.

The same company manufactures an automatic saw sharpener, which is also illustrated. This machine will sharpen cutting saws from 12 in. to 20 in. in diameter. It is fitted with a beveling device, which relieves the tooth one-half of its thickness at its point, the base remaining the full thickness of blade.

This form of tooth breaks up the chips, causes the saw to run much freer and practically eliminates the liability of the saw sticking in cutting soft stock. No full width of the tool is presented to the surface to be cut. A saw $\frac{5}{32}$-in. thick can be operated as easily as one one-half as thick sharpened in the usual way. After one side of every other tooth has been beveled the saw is turned over and alternating teeth treated the same way. The reciprocation of the grinding wheel and the indexing are automatic, but the depth of the cut is regulated by hand. The weight of this machine is 422 lbs.



Nutter & Barnes Cutting-Off Machine.



Nutter & Barnes Automatic Saw Sharpener.

The Nutter & Barnes Company, 326 A street, Boston, Mass., make a specialty of metal saw cutting-off machines and automatic saw sharpeners.

It is said that the British government has approved in principle the American proposal for the construction of the Tsitsikhar Railway from Aigun in Northern Manchuria to Chin Chow Fu. Japan also would agree to participate, but the Chinese officials, it is understood, differ as to the utility of the line, and some of them object to Japan's participation. The railway plan recently was laid before the British government, with a view of inducing British financiers to take a hand in the enterprise.